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# KEY TO PRONUNCIATION.

| | |
|---|---|
| ä | far, father |
| ā | fate, hate |
| a or ă | at, fat |
| ã | air, care |
| ạ | ado, sofa |
| â | all, fall |
| ch | choose, church |
| ē | eel, we |
| e or ĕ | bed, end |
| ė | her, over: also Fr. *e*, as in *de; eu*, as in *neuf;* and *oeu*, as in *boeuf*, *coeur;* Ger. *ö* (or *oe*), as in *ökonomie.* |
| ẹ | befall, elope |
| ë | agent, trident |
| ff | off, trough |
| g | gas, get |
| gw | anguish, guava |
| h | hat, hot |
| *h* or ʜ | Ger. *ch*, as in *nicht, wacht* |
| hw | what |
| ī | file, ice |
| i or ĭ | him, it |
| î | between e and i, mostly in Oriental final syllables, as, Ferid-ud-din |
| j | gem, genius |
| kw | quaint, quite |
| ṅ | Fr. nasal *m* or *n*, as in *embonpoint, Jean, temps* |
| ñ | Span. *ñ*, as in *cañon* (căn′yŏn), *piñon* (pēn′yŏn) |
| ng | mingle, singing |
| nk | bank, ink |
| ō | no, open |
| o or ŏ | not, on |
| ô | corn, nor |
| ȯ | atom, symbol |
| ọ | book, look |
| oi | oil, soil; also Ger. *eu*, as in *beutel* |
| ö or oo | fool, rule |
| ou or ow | allow, bowsprit |
| s | satisfy, sauce |
| sh | show, sure |
| th | thick, thin |
| ŧh | father, thither |
| ū | mute, use |
| u or ŭ | but, us |
| u̇ | pull, put |
| ü | between u and e, as in Fr. *sur*, Ger. *Müller* |
| v | of, very |
| y | (consonantal) yes, young |
| z | pleasant, rose |
| zh | azure, pleasure |
| ′(prime), ″(secondary) | accents, to indicate syllabic stress |

# ENCYCLOPEDIA AMERICANA

# P

**PUMPS, Compressed-Air.** During recent years much progress has been made in the art of pumping water by compressed air. At first all methods of lifting water or other liquids by means of compressed air were deemed extravagant, but the development of various systems has been such that water may be pumped with marked economy and rapidity by compressed air. The direct-acting piston or plunger pump, of simple or duplex type, is operated with little economy with steam as a motive power. One hundred and fifty pounds of steam per horse power per hour is a fair figure to take for this machine. Experiments have shown that under average conditions hardly 50 per cent of the indicated horse power of the driving cylinder is utilized in the pump cylinder, the rest being absorbed partly by the engine as machine friction and particularly by the friction of the water in passage through valves and chambers.

Compressed air is utilized in pumping in two distinct ways, (1) as the motive power in power driven pumps; and (2) directly upon the liquid in displacement pumps.

**Power Driven Pumps.**— The advantage of the power driven pump over the displacement pump lies in the fact that it permits the expansive use of the compressed air, resulting in a considerable saving and economy. Power pumps consist essentially of expansive air engines, which may be either directly connected, belted or geared to some form of duplex or triplex piston or plunger pump, or to the simple, compound or turbine types of centrifugal pump in its various forms. Compressed air is supplied to the air engine from some more or less distant air compressor and this air engine, when specially designed for the use of air involving considerations of air valves and low clearance, operates with efficiency and economy. Where the magnitude of the operation justifies it, the use of the «return pipe» system with expansive engines will, in connection with reheaters, secure the very highest efficiency.

This type of pump consists essentially of two parts, an air end and a water end. The compressed air operates a piston which transmits its energy through the piston rod which, in turn, causes the pump piston or plunger to reciprocate and thereby pump water. In the «return pipe» or «closed circuit» system, the same air is used over and over again, the exhaust from the pumps being piped back to the compressor under a limited back pressure. In this case the compressed air is a transmitter of power just as a belt or transmission rope, but the air never wears out, may be carried to any distance and at any angle, has little inherent friction and possesses the highest efficiency in transmission. The system eliminates all trouble from freezing since the air is used repeatedly and moisture once removed cannot be returned. While it requires two pipe lines instead of one, the pipe cost is frequently less because of the smaller pipe size permitted. The pump cylinders may be smaller because of the higher effective pressure per square inch and the losses in clearance, often enormous, are entirely eliminated. The great economy in this system is secured in the higher compression, since the scheme is based upon the well-known fact that the greatest losses in compression are thermodynamic, which losses are suffered chiefly at the lower pressures. For example 13.42 horse power will compress 100 cubic feet of free air per second to 60 pounds pressure, starting at atmospheric pressure. This same energy will compress 100 cubic feet of air to 350 pounds, when beginning compression at 60 pounds, giving on the return pipe system 290 pounds available pressure with 60 pounds back pressure. A reheater on the pump will secure additional economy. Losses through leakage and transmission are supplied by a small «booster» compressor. Where the pressure is above 60 pounds two-stage pumps are employed; where above 300 pounds, three-stage pumps.

Another method of securing high economy is to employ compound or triple expansion pumps, reheating the air after each expansion. This may reduce the air consumption to ½ or ⅓ its volume in the simple pump of the same capacity. In some cases this same result may be secured by the use of three pumps in series, reheaters being used as before after each expansion and the exhaust from one pump being supplied to the next, with a larger air cylinder.

**Displacement or Pneumatic Pumps.**— The displacement pump is almost the essence of pumping simplicity and, if its first promises had been borne out, it would be a most powerful factor in pumping problems. As it is, within its recognized field, it has shown a fitness which qualifies it especially for the work. In brief, it consists of two chambers or cylinders which are filled and discharged alternately — the liquid in each chamber being directly displaced by the admission of the required volume of compressed air through a valve operating automatically.

The fundamental requirement is a complete submergence of three to six feet, or the setting of the chambers in a dry pit at a level so much lower than the water to be pumped that the chambers may fill rapidly by gravity. The filling is done at no expense of power and the discharge with a minimum of friction losses. Dirt, sand or grit will not interfere with its operation. Such a pump starts and stops automatically and uses air exactly in proportion to the amount of water discharged. It will run for weeks without attention and requires practically no repairs. Standard sizes have capacities up to 1,500 gallons per minute.

The height to which these pumps will lift water is limited only by the air pressure used, and by an arrangement of several pumps and reservoirs in series or steps almost any height may be attained with ordinary moderate air pressures. In mine work the displacement pump is especially useful in handling water accumulating in sumps, dips, entries, etc. It is also peculiarly effective in subways and tunnels, in automatically discharging the seepage or leakage water which accumulates. It may also serve in the basement of factories and warehouses which are subject to occasional inundations by floods or high water. Another very important economic use is the lifting of sewage from low-level catch-basins into the trunk sewer at a higher level. The same apparatus, but in modified form, is employed for elevating acids and heavy chemical solutions or for pumping marl, paints and other semi-fluids. In this case the air valve is so located that it is not affected by contact with the liquid or by corrosive fumes arising therefrom. The capacity of the displacement pump is determined by the size of the cylinders or chambers and the volume of air available. Employing air at ordinary pressure from a common single stage air compressor with a lift not exceeding 250 feet, the efficiency of the displacement pump is higher than that of the usual reciprocating plunger pump under the same conditions of lift and pressure. There are three distinct types of these pumps known as the Latta-Martin, Halsey and Harris or «return-air.»

The Latta-Martin system employs two tanks, side by side, with a valve arrangement to convey compressed air to a point near the bottom of the eduction pipe. The air pipe is connected with a compressed-air reservoir on the surface, which is in or near the engine room in which free air is compressed. Before turning on the air the conditions in the well show water at the same level on the outside and inside of the eduction pipe. At the first operation we must have sufficient air pressure to lift to the surface the column of water which stands in the eduction pipe. This goes out *en masse*, after which the pump assumes a normal condition, the working air pressure being then lowered to stand at a point corresponding with the normal conditions in the well. This is determined by the volume of water which a well will yield in a certain time and the elevation to which the water is discharged. It was first supposed that in all air-lift cases the water was discharged because of the aeration of the water in the eduction pipe due to the intimate commingling of air and water. Bubbles of air rising in a water column not only have a tendency to carry particles of water with the air, but the column is made lighter, and, with a submergence or weight of water on the outside of the eduction pipe there would naturally be a constant discharge of air and water. This is known as the Frizell system and where the lifts are moderate, that is, where the water in the well reaches a point near the surface, it is very likely that the discharge could be effected by simple aeration.

Most air-lift propositions are deep-well cases, that is, the water is lifted a distance greater than 25 feet. Aeration will not suffice to expel such water, so the idea of piston-like layers of expanding air alternating with blocks of water is developed. The upward urge of the air to reach the lower degree of pressure in the atmosphere and thus restore its equilibrium as free air carries or impels the blocks of water ahead of it to the discharge gate where separation takes place, the air escaping into the atmosphere and the water flowing away in the conduit provided. The economy of the air-lift system is in direct proportion to the capacity of the well to form these piston-like layers and the reason why they are formed is after the first discharge there is kept up a constant struggle between the air under pressure and the head of water on the outside of the pipe, each one seeking to enter the lower end of the eduction pipe.

When the air pressure is greater than that due to the head of water, a certain volume of compressed air is admitted into the eduction pipe. If a sufficient quantity of air has been admitted in proportion to the diameter of pipe, and if there is a sufficient pressure in this pipe to prevent the free discharge of the air, it is readily seen how this bubble of air spreads itself across the diameter of the pipe in a piston-like condition. The reason why this piston is not elongated and continuous is that the free discharge of the air, aided by the velocity with which everything in the eduction pipe is moving, causes a fall in the air pressure just sufficient to allow the water head to press the water into the open end of the eduction pipe. In other words, as the air pressure is for the moment slightly lower, the water pressure which was nearly equal to the air pressure, becomes a little greater and the piston-like layer of water enters the pipe, shutting off the air. This «chunk» of water rises in the eduction pipe with a velocity equal to that of the rising bubble of air and as it has plugged off the air nozzle, there is a momentary rest, during which the air has a chance to accumulate greater pressure, and just controlling the admission and discharge of water and air. In operation the pump is completely submerged and one cylinder fills by gravity while air is forcing out the water from the other. When this cylinder is empty, the air is automatically released, escaping into the atmosphere, and the water enters, the compressed air meanwhile being applied to empty the other cylinder. The discharge water flows continuously.

The Halsey system employs either a single tank or double tanks, as desired, and must be submerged to insure good operation. The tank fills by gravity, and as the water enters it causes a float to rise, which, when near the top of the tank, drops a valve and permits the influx of compressed air to discharge the water. The flow of water is intermittent with the single tank, but continuous with the double tank. Neither the Latta-Martin nor the Halsey system uses compressed air expansively, and as a result there is considerable energy lost through the escape of the compressed air into the atmosphere — as with the high-pressure steam engine.

The «return-air» system overcomes the difficulty of not employing air expansively and in it no floats and no air valves, outside the engine room, are employed and the same air is used over and over again, thus eliminating the effect of clearance. This system employs two tanks and its operation consists in brief of pumping air out of one tank and forcing it into the other, and in so doing will draw water into the former and force it out of the latter. The content or volume of air in the system is so adjusted that when one tank is empty the other is full, and at that moment the switch will be automatically thrown, reversing the pipe action and thereby reversing the action of the tanks.

Figure 1 presents a conventional diagram of the displacement type of compressed-air pumps, drawn in this instance to show the action of the Harris or «return-air» pump. The air is being pumped out of chamber A and into chamber B, the water from which is passing up the discharge-pipe D, under the pressure exerted by the air on the surface of the water in B. When chamber A is full the valves on the air-pump reverse automatically and the air is pumped into A and out of B, the valves in the inlet box below the chambers reverse their positions and the water is forced out of A into the discharge-pipe, and a new charge of water is sucked from the reservoir into B as the air content is exhausted by the air-pump. This diagram explains equally well the action of the Latta-Martin and the double-tank type of the Halsey pumps — supposing only that the chambers of the two last mentioned are submerged so deeply in the reservoir that they fill naturally by gravity through a valve in the top which is tripped by an interior float when the chamber is full. The same trip opens the air valve and allows the compressed air to enter, driving the water before it into the discharge-pipe. With both these systems the air escapes into the atmosphere instead of returning to the compressor.

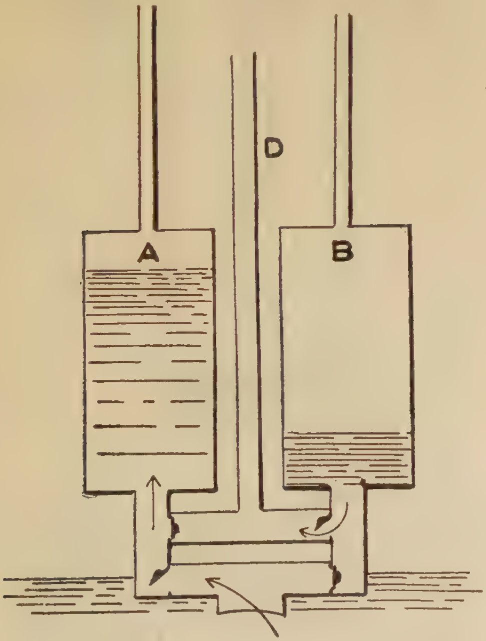


FIG. 1.

Of all systems of pumping the Harris is certainly the most economical and efficient. Using the air expansively, all the inherent energy of compressed air is used, and no mechanism being submerged, there is no chance for the system to become inoperative due to breakage or a demand for repairs. This system may be employed for pumping mixtures of sand and water, and operates with a marked degree of economy and reliability.

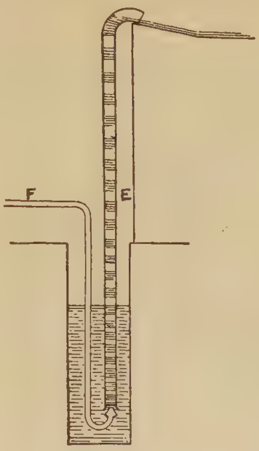


FIG. 2.

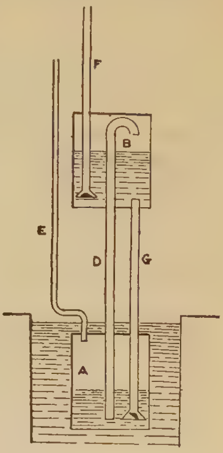


FIG. 3.

**Air-Lift.**— Opinions differ as to the theory of the air-lift. A common air-lift is one where we have a driven well in which the water is comparatively near the surface. We place in this well a pipe for the discharge of the water. This is known as the «eduction pipe.» This pipe does not touch the bottom of the well, but is lifted above it so as to admit freely the water through its lower end. Alongside this pipe, either on the outside or within, is a second but smaller pipe, properly proportioned; as soon as this pressure overcomes that of the water, the conditions are reversed and another «chunk» of compressed air is discharged into the pipe, shutting off the water for an instant. This process is continuous and as regular as the movement of a pendulum.

As these «chunks» of air approach the surfact they are gradually enlarged, because of the reduced load upon them, and it is likely that before they reach the surface there is a general breaking up of the piston-like layer condition.

Figure 2 illustrates the action of the deep-well Pohlé air-lift, where the pressure of the air has to be relatively high. The pipe F leads the air from the compressor to the foot of the eduction pipe E. Where the diameter of the eduction pipe is properly proportioned to the weight of the column of water to be lifted, the compressed air pushes out of the air-pipe in little pledgets, one after another, holding their piston-like shape across the diameter of the eduction pipe, and each lifting its little load of water toward the free air at normal atmospheric pressure above. Where the lift is not so high and the weight of the water column not very great, the air is released at the bottom of the eduction pipe in bubbles, perhaps from several orifices at once, as in the Frizell system, and thus the water is aerated, rendering it so light that it flows freely upward with the air hastening to escape into the lower pressure above.

The differential air-lift operates with a comparatively low air pressure, and by using the air expansively achieves a considerable lift. The device consists of two (or more) air chambers, with the general arrangement shown in the explanatory diagram, Figure 3. It is to be supposed that the compressed air is being pumped into chamber A, exerting a pressure which forces the contained water upward through pipe G into chamber B. When the level of the water in A has sunk below the open end of pipe D the supply of compressed air is automatically shut off, and the compressed air then in A expands through pipe D into chamber B, there exerting a pressure which opens the valve at the foot of pipe F, up which the water contained in B is then forced. It is readily seen that the air pressure in B (supposing the chambers to be of the same dimensions) will be half that in A. If there is in the series a third chamber (C) of the same size and arrangement of pipes and valves, the air pressure in C will be one-third of the original pressure pumped into A. The possible lift from B to C will, of course, be just half that from A to B. Upon the final escape of the air at the top of the lift, chamber A fills with water by gravity and the cycle is renewed. A certain substantial amount of water pressure is necessary to smooth working of the air-lift. This is commonly secured by deep immersion of the eduction pipe. Where this cannot be secured an auxiliary air chamber is installed from which the air is pumped, the water flowing in to fill the vacuum as in the ordinary suction pump. On reversing the air, pressure is exerted downward on the water in the auxiliary chamber, thus forming an artificial "head" sufficient to lift the air-shaft.

The Pohlé system of air-lift is probably the best known. Sand, grit and small stones are no obstacles in the satisfactory operation of this system. As a matter of fact, in many instances the capacities of the wells have been increased by opening up the well more thoroughly through this removal of the sand. Water pumped by this system is purified to some extent — more so in the Frizell system — by the aeration. The system is not limited as to the quantity of water that can be handled. This will depend upon the capacity of the wells to furnish the water. The height of the lift is limited only by the degree of pressure imparted to the air. Consult Greene, A. M., Jr., 'Pumping Machinery' (New York 1911); Ivens, E. M., 'Pumping by Compressed Air' (New York 1914).

**PUMPS AND PUMPING MACHINERY.** In the modern acceptation of the term, a pump is a machine for exerting mechanical action upon fluids. It is commonly employed for raising liquids to a higher level; for propelling them through pipes and orifices under (hydraulic) pressure; and for the compressing and rarefying of gaseous substances. The pumps used for compressing gases are discussed under the title AIR COMPRESSORS; those for rarefication under AIR-PUMP and VACUUM-PUMP.

Pumps operate by two quite distinct methods, and are consequently classified as (1) suction or "bucket" pumps and (2) force pumps. The suction pump depends for its operation upon the constant pressure of the atmosphere — 14.7 pounds per square inch. The action of the pump is to release from this pressure that area under the influence of the pump's piston: the air pressure outside of that area causes fluids affected by it to flow into the space in which the pressure has been diminished. In the force pump the force is applied directly by the pump mechanism to the fluid to be moved, regardless of atmospheric pressure. In its simplest form, the modern atmospheric or suction pump consists of a cylinder (*c*) connected at the bottom with a pipe (*p*), the lower end of which is immersed below the surface of the water. In the cylinder are placed two valves (*uv* and *lv*), the lower stationary and the upper attached to a piston (*f*) at the end of a rod (*r*), which moves the piston up and down under the motion of a handle (*h*). A pipe or spout (*s*), attached to the cylinder near its upper end, receives and discharges the water raised by the working of

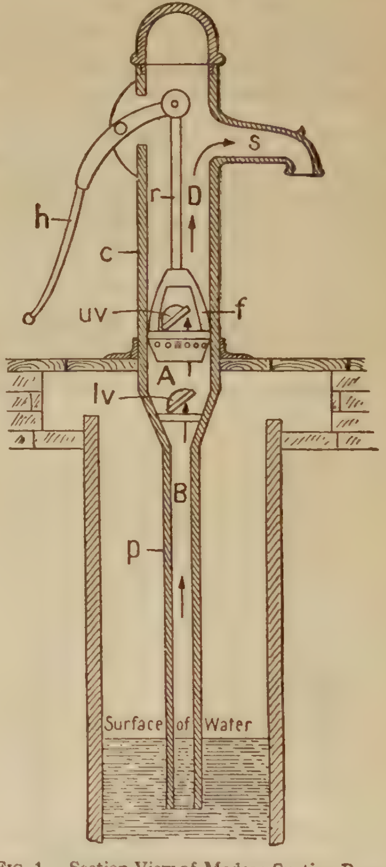


FIG. 1.—Section View of Modern Suction Pump.

the piston. Both the valves open upward, and the action of the entire arrangement, based upon the physical fact that two bodies cannot occupy the same space at the same time, is as follows: When the downward stroke of the handle moves the piston upward, the air in the space *A* is rarefied, having to occupy a greater space, and the partial vacuum thus formed relieves the pressure of the atmosphere from the lower valve, which being opened upward by the pressure of the air in the space (*B*) of the pipe, allows a portion of it to pass into the space (*A*). When the piston descends under the upward stroke of the handle, the air in the space (*A*) is compressed, the lower valve is closed, and when the density of the compressed air becomes greater than that of the atmosphere, the upper valve is forced open and the air passes into and out of the space (*D*). Thus, by the continued up and down movement of the piston, all the air in the space (*B*) is completely exhausted, the water rising in the suction pipe under the pressure of the atmosphere upon its surface in the well, until it fills the space (*B*) up to the lower valve. The next upward movement of the piston empties the air in the space (*A*), which is immediately filled with water by the opening of the lower valve. The downward motion of the piston relieves the pressure and allows the lower valve to fall into its seat. The water then in the lower part of the pump flows through the valve in the piston into the space (*D*), from which it is discharged through the spout by the next upward movement of the piston which at the same time refills the space (*A*) by suction. Under the laws of fluid pressure discovered by the experiments of Torricelli and others, the height to which a column of water will rise depends upon the atmospheric pressure at any point on the earth's surface, and varies with the altitude of that point. At the level of the sea, the atmosphere exerts a pressure of 14.7 pounds to the square inch, and will support a column of water in a closed tube from which the air has been exhausted, between 33 and 34 feet in height, while upon the top of Mont Blanc, or Pike's Peak, 15,000 or 16,000 feet above the sea, the atmospheric pressure will support a similar column of water only about 16 or 17 feet in height. A knowledge of this fact is important not only in determining the maximum distance at which the lower valve of a pump may be placed from the surface of water to be pumped, but also in every branch of hydraulic engineering in which atmospheric pressure is utilized.

By far the greater amount of pumping done in the economic world is accomplished by force pumps. It is, however, generally the case that the principle of the suction pump is used in combination to a greater or less degree, atmospheric pressure being relied on for preliminary lifts not to exceed 16 or 18 feet above the basic water level.

Force pumps are of two general types: (1) the piston pump, and (2) the plunger pump. In the former a well-fitted piston is driven to and fro in a smoothly-bored cylinder to which the water to be pumped is admitted. The pressure of the moving piston upon the water forces it out of the cylinder by any valve opening freely outward, and thus into pipes through which it may be raised to heights varying with the power exerted on the piston; or it may transmit the pressure of the piston to all water in a long pipe line for power purposes. The plunger pump is similar in results, but develops its pressure by the forcible thrusting of the comparatively large mass of the plunger into a chamber already filled with water. The water being incompressible, a volume of it equal to the bulk of the entering plunger is driven out of the chamber into the transmission pipes. Both piston and plunger pumps are usually designed to act both on the outward and the return strokes — the piston sucking in a supply of water behind it as it moves in either direction; and the plunger being double-ended, and working alternately into two chambers divided by a wall or a diaphragm carrying a packing ring or sleeve. These types are known as double-acting pumps. In the sectional diagram of a piston force-pump shown in Fig. 2, the piston P is represented as starting on its outward stroke. The water W before it is being forced upward through valve E into the discharge-pipe system D, while valves F and K are held shut by the internal pressure. Valve H in the supply-pipe system opens by «suction,» and the supply water flows in behind the advancing piston. On the return or inward stroke,

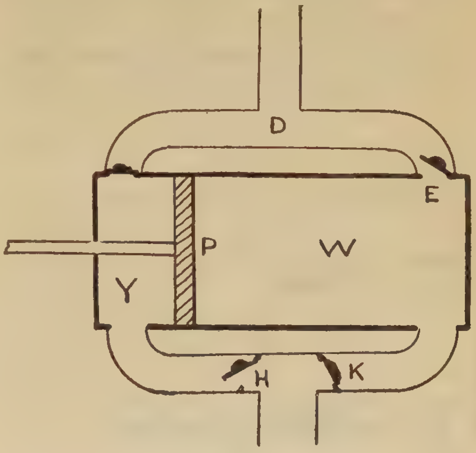


FIG. 2.

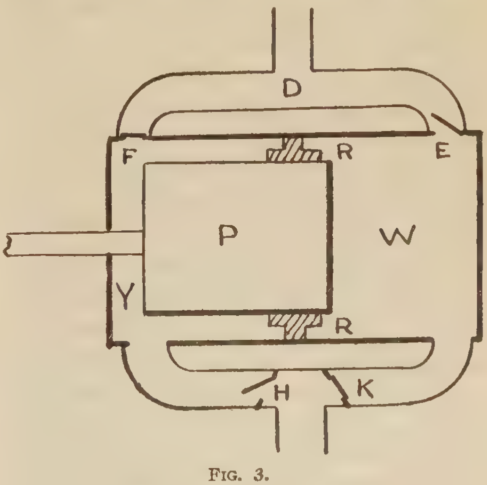


FIG. 3.

valve F opens for the discharge of the water which has just come through H, and valve K opens to allow the supply to again fill the cylinder. The same description applies to the diagram of the plunger force-pump, Fig. 3; in which P represents the plunger which drives outward and back alternately into chambers W and Y, divided by the packing-ring R, R.

A variation of the plunger pump is the «differential» pump, in which the valves and double-acting plunger are so arranged that while suction of the supply water takes place only on the outward stroke, a discharge occurs upon the strokes in both directions. Fig. 4 presents a sectional diagram of the most common form of the differential pump, in which P represents the plunger, working in the sleeve R, R. On the inward stroke just beginning, the water in chamber W is forced out into the discharge system D, valve K opening to allow a supply to be drawn in (by suction) through pipe S into chamber Y. On the return stroke valve K is closed by the pressure, and valve E opens, and another discharge into D occurs.

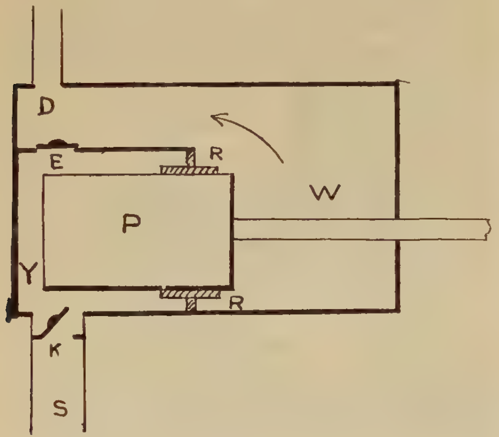


Fig. 4.

While there are undoubtedly a larger number of pumps worked by hand than by any other power, such pumps are relatively small, and are not operated continuously. By far the greater part of the world's pumping, as to volume, is done with what are called power pumps, many of them being very large. The power generally employed is steam, although compressed air is coming more and more into use, being found more economical. (See Pumps, Compressed-Air). The attachment of the power to the pump has generally taken the tandem form, with the power cylinder at one end and the pump cylinder at the other, the piston rod of the steam cylinder being extended to form the piston rod or plunger rod of the pump. This type is known as the direct-acting pump. In other arrangements the steam cylinder may act upon a walking-beam to which the pump rod is connected; or it may work upon a shaft on which is a fly-wheel. Frequently the work is divided, two or three cylinders being provided for both steam and pumps, working alternately or in succession, and thus discharging a more nearly continuous and uniform volume of water. All of these power pumps discharge the water against a cushion of air, the elasticity of which relieves pump, engine and piping of shocks which otherwise would soon be disastrous to their mechanism. These air chambers are, therefore, to be considered an essential part of the pump. They are proportioned to the volume of water delivered per minute, and the pressure which is to be preserved in the pipe line into which the water is delivered, a certain specific volume of air being necessary to transmit the particular pressures of the individual installation. In some makes of pumps air chambers are placed also on the suction pipe, to take up and distribute (in point of time) the strains of operation, aiding materially in maintaining a uniform discharge.

Rotary pumps, formerly in limited use, have become very numerous, as the electric motor offers an ideal power for small installations. These pumps are of two general types, called conventionally «piston» and «plunger.» In the piston rotary pump the piston-rod carries longitudinal wings or vanes which produce a «wiping» pressure on the water in the cylinder as the piston revolves on its axis. The more modern types are fitted with two «pistons» set parallel, the wings of which interlock to prevent a backward flow of the water. They are run usually at great speed by small dynamos, and do excellent service in raising comparatively small quantities of water to the service tanks on the roofs of buildings of moderate height. The plunger type of rotary pump has a cylindrical plunger revolving on a longitudinal axis placed eccentrically as to the plunger, but in the centre of a larger cylinder in which the plunger revolves. A longitudinal backstop, actuated by springs, or by its own weight, prevents the water crowded out of one-half of the cylinder from flowing back into the half whence it was forced by the plunger. Another form of rotary pump is the «screw» pump, a cylinder having a longitudinal centre shaft set with a series of blades like those of a screw propeller. This is sometimes called an «impeller» pump, and is of great utility in pumping sewage and similar heavy and heterogeneous liquid mixtures which could not be

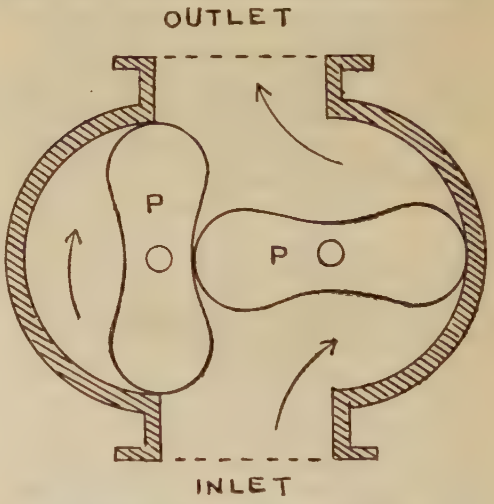


Fig. 5.—Sectional Diagram of Piston Rotary Pump. P, P, pistons revolving in opposite directions.

moved by the forms of pumps commonly in use. One of the last-named type was constructed at Milwaukee in 1889 to flush the Milwaukee River of its sewage-polluted waters. It has a screw wheel 13 feet in diameter, which, revolving at a rate of 60 revolutions per minute, delivers 550,000,000 gallons of water a day on a lift of four feet. This water is forced through a brick-lined tunnel 12 feet in diameter, and 2,500 feet long. A battery of 11 of these screw pumps are in use in New Orleans for discharging storm water from the city's drainage system. They are 12 feet in diameter and run at a speed of 75 revolutions per minute. The screw is placed at the summit of a flat-topped siphon and is operated by an electric motor. The discharge is about 550 cubic feet per minute, the height raised varying from five to nine feet. The efficiency of these pumps as shown by actual tests is 80 per cent.

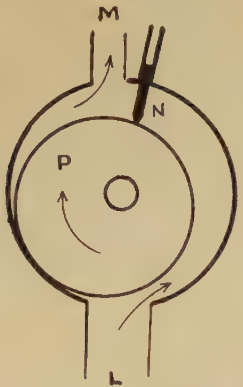


FIG. 6.—Sectional Diagram of Plunger Rotary Pump. L, inlet; M, outlet; N, back stop; P, rotating plunger.

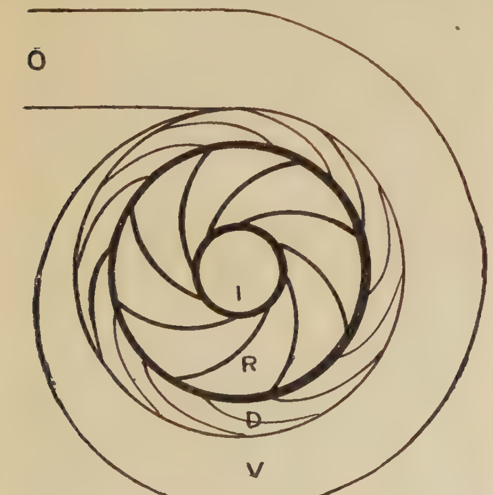


FIG. 7.—Sectional diagram of centrifugal pump. I, inlet; R, rotor; D, diffusing chamber; V, volute casing; O, outlet.

The «centrifugal pump» is the best known representative of the «impeller» type. It embodies the principle — that a body revolving around a centre tends to move away from it with a force proportional to its velocity; thus the rim of a revolving wheel imparts a portion of its velocity to any substance adhering to it, and throws it off when the force of the velocity thus imparted exceeds the force of adhesion, as the mud thrown off by the wheels of a carriage, or the water from a mop or towel, rapidly revolved by the hand. The first pump of this type was invented by M. Le Demour, who sent a description of it to the Academie Française in 1732. It consisted of a straight tube attached in an inclined position to a vertical axis, around which it was whirled by a crank-handle. Later forms were constructed by tubes joined in the form of a T, the vertical tube of which was placed in the water. The lower end perforated to admit the water, and fitted with a valve to retain the water in the vertical tube when the pump was not in operation, was placed under the surface of the water and supported upon a pivot. The ends of the horizontal discharge tube were bent down into a circular trough over which they were revolved. When the machine was revolved rapidly the centrifugal force which discharged the water in the horizontal tube was communicated to the water in the vertical, which was also drawn out, but in the meantime refilled by the atmospheric pressure on the reservoir. When it is required to lift large quantities of water to a low elevation, centrifugal pumps may be used with greater efficiency than reciprocating pumps, the efficiency of which diminishes with the lift. A pump of this kind, constructed in Massachusetts in 1818, was equipped with four blades set at right angles like those of a fan blower, and was used for many years. An improved form was exhibited by Appold in England, in 1851, which embodied all of the principal features employed in the best pumps constructed since that time. It is stated that Appold's pump raised continuously a quantity of water equal to 1,400 times its own capacity per minute. The «whirlpool chamber,» designed to utilize the energy developed by the whirling water which in most pumps of this type is lost as eddies in the discharge pipe, was suggested by Thomson (Eng.), and consisted of a chamber somewhat larger than the pump, in which the water discharged by the pump disc, with considerable velocity, was allowed to rotate and impart its energy as an auxiliary aid to the driving power. A pump constructed by him for drainage purposes, in the Barbados, was equipped with a whirlpool chamber 32 feet in diameter, around a pump disc 16 feet in diameter. Others of large size were constructed by Easton and Anderson, for the North Sea Canal, in Holland, which were capable of delivering 670 tons of water per minute to a height of five feet; while the Gwynne pumps employed to drain the Ferrarese marshes in Italy, at the junction of the Po di Volano and the minor rivers of lower Lombardy, are capable of a combined delivery of 2,000 tons of water per minute.

A large class of pumps, involving the principle of centrifugal action in some degree are the turbine pumps.

The turbine pump is practically a reversal of the turbine water-wheel (q.v.), being a turbine run by power, generally steam, to produce motion or pressure in a body of water or other liquid. It differs from the centrifugal pump in adding the power advantage of the screw to that of centrifugal force. A common application of this form of pump where the lift is high and the pressure heavy is to place these pumps in series, the second taking its supply water from the first, and so starting its work with a considerable degree of pressure; the third pump taking water from the second, and so on. As many as 10 of these turbines may be thus combined to form the «ten-stage» turbine pump. By this means the load is distributed, the velocities of the rotors being transmuted into pressure in the diffusing chambers. These multi-stage turbine pumps are used in the equipment of fire-boats, which are required to deliver great volumes of water at high pressure.

The injector and the pulsometer are also classified as pumps, though operating on principles quite different from those exhibited in the machines more familiarly known under the title of «pump.» The injector is described in detail in a special article (see INJECTOR). The pulsometer consists of two bottle-shaped chambers (*a*) and (*b*), the tapering necks of which incline toward each other in a common passage at (*c*). At the lower end of this passage is a valve (*d*), which when moved slightly will simultaneously close the opening of the neck of one chamber, and open that of the other.

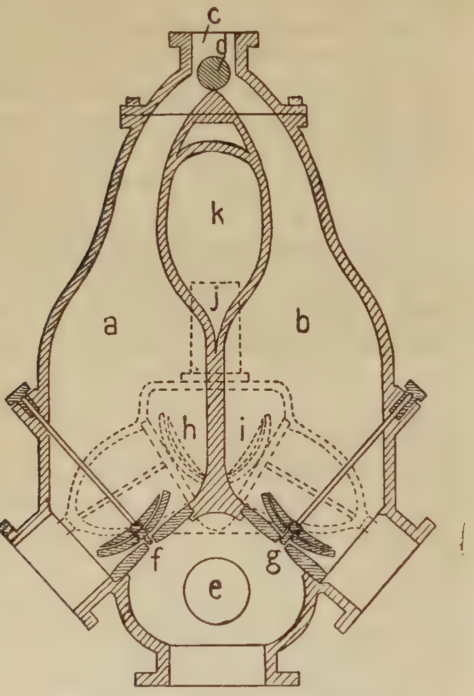


FIG. 8.—Sectional View of Pulsometer.

Water is admitted into the chambers through the passage (*e*), and valves (*f*) (*g*) and forced out through the valves (*h*) (*i*), and passage (*j*) into the air chamber (*k*). The device operates as follows: Suppose both chambers are full of water and the valve (*d*) to the right. When steam is admitted to the chamber (*a*) the water is forced out by direct pressure through the valve (*h*) into the air chamber (*k*), so that when the chamber (*a*) is nearly or quite empty, the valve (*d*) moves to the left, cutting off the steam from the chamber (*a*) and admittting it to the chamber (*b*), from which the water is gradually forced out. In the meantime the condensation of the steam in the chamber (*a*) creates a partial vacuum, and the pressure of the atmosphere on the external water forces it through the valve (*f*) into the chamber, so that when it is nearly full, the air it contains will be sufficiently compressed to force the valve (*d*) over to the right, thus producing a continuous action. The efficiency of pulsometers is equal to that of small direct-acting feed pumps, and they are extensively used on account of their simple construction and great durability. Nearly allied to the injector and pulsometer in point of the physical action involved is the «explosion,» or «internal combustion» pump — a typical example of which is the so-called Humphrey gas pump. It consists of a chamber (A) in which an explosive mixture of air and vaporized gasoline is admitted through the valve (V). This mixture is exploded by an electric spark, and the expanding gases press downward upon the water in the chamber (B), forcing it out through the pipe-line (P), and into the reservoir (R) and up the standpipe (D). When the force of the gas has expended itself the escape valve (E) drops in the reduced pressure, and the burned gases pass out before the return surge of the water standing in the standpipe (D). Meanwhile, in the low pressure prevailing, the inlet valves (I) open and admit water from the basin (K), which pours into chamber (B) until the returning water from the pipe-line brings pressure enough to close them, and also the exhaust valve (E), and opens the gas valve (V) by a float. A backward surge of the water, in coming to an equilibrium, sucks in a charge of gas through (G), and the vibrating water comes back once more and compresses the gas, at which juncture it is fired; and the cycle is repeated indefinitely. It will be seen that one delivery of water covers four vibrations in the pump. This leisurely action has been reduced to half the time by connecting two pairs of chambers to the suction pipe, so that the first resurge after firing compresses the gas charge in the second gas chamber, and fires it, each resurge thus being sent forward as a discharge. The largest of these gas pumps in America is a 66-inch pump in irrigation service at Del Rio, Texas, delivering 28,000 gallons per minute at a height of 38 feet.

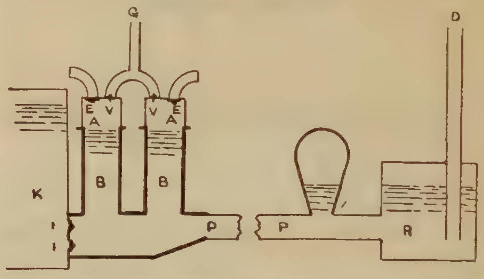


FIG. 9.—Sectional Diagram of Double-cylindered "Humphrey" Type of Gas Pump.

«Impulse pumps» are those operated by the impact of a falling column of water or by the force of a moving column of water suddenly arrested, or by jets of steam, compressed air, or water under high pressure. The hydraulic ram is an example of the first group. It was originally designed by Whitehurst, a watchmaker of Derby, England, in 1772, and subsequently perfected by Montgolfier, the famous French balloonist, in 1796. It consists of a supply pipe (*a*); an air-chamber (*b*) attached to the upper side of the pipe (*a*), and fitted with a valve (*c*) at the pipe opening; a valve (*d*) at the end of the supply pipe, and a vertical pipe (*e*), opening freely into the air-chamber, through which the water is raised to the desired elevation. The device operates as follows: The valve (*d*) is made just heavy enough to drop and open the lower end of the pipe (*a*) when the water filling the pipe is at rest. Now assume that this valve opens, allowing the water in (*a*) to run out. This water gradually acquires an increasing momentum, which finally carries the valve up against its seat and closes the outlet. The water in (*a*) is thus brought suddenly to a state of rest and a part of it rushes into the air-chamber (*b*) through the valve (*c*). But, the instant the water in (*a*) is again in a state of rest, the valve (*d*) drops again, opens the outlet, allows the water to run out, and is again closed when the increasing pressure is strong enough, bringing the water again to a sudden halt and forcing some more of it into the air-chamber, thence by the elasticity of the air cushion (*b*) to be pushed upward through the pipe (*e*) to the point of delivery — and thus the cycle is continued. The action of the valve (*c*) prevents the return of the water from the air-chamber to the pipe (*a*). This device is adapted to numerous locations and will operate automatically and continuously, without any attention whatever, so long as the surface of the water at the source of supply is kept at the same elevation so as to insure a uniform pressure against the valve (*d*). When the perpendicular distance from the source of supply to the valve (*d*) is small, and the water is required to be raised to a comparatively great height, pipe (*a*) must not only have a considerable fall but must be of larger diameter, and be of sufficient length to prevent the water from being thrown back into the source of supply by the shock when the valve (*d*) closes. It is also necessary to maintain the supply of air in the air-chamber, which in time, under the great pressure, becomes depleted by being dissolved in the water. In small rams a sufficient amount of air enters through the valve (*d*), but in rams of considerable size a small «snifting valve,» attached to another chamber immediately below the air chamber, automatically supplies the additional air whenever it is necessary.

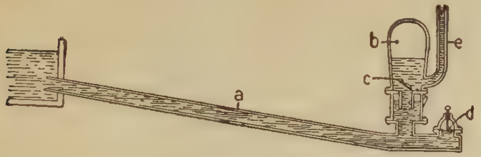


Fig. 10.—Sectional View of Hydraulic Ram.

Jet pumps operating with steam or compressed air are termed «ejectors.» They are in use for spraying or atomizing liquids in various manufacturing processes. The jet pumps operating with high pressure water are known commercially also as «eductors.» They have no valves or other moving parts, and are not subject to wear and tear, and, being also of low first cost, are very economical where a small supply of high-pressure water can be commanded. The construction is extremely simple. The high-pressure pipe is placed in the centre axially of a larger flow or discharge pipe and fitted with a conical mouthpiece. The discharge pipe is narrowed at the opening of the jet and then expanded gradually to its full size. With a three-inch discharge pipe and a one and one-half-inch jet pipe operating with a pressure of 40 pounds to the square inch (about 90 feet head) the discharge will amount to 5,000 gallons per hour. For lifting water the pressure in pounds per square inch of the jet opening is made two and one-half times the elevation in feet. Thus if the lift is 20 feet the pressure required is 50 pounds. The eductor works well on the level of discharge if the suction lift is not more than 15 feet.

The so-called «high-duty» pumps are those in use for heavy work against great pressure. They include waterworks pumps, mine pumps, fire-service pumps, elevator pumps, hydraulic pressure pumps and the like. Practically all are direct-acting pumps operated by steam. They are built both in the horizontal and upright forms. One of the first American pumps designed for high-duty waterworks service was the «Worthington direct-acting duplex steam pump.» It consists of two double-acting plunger pumps placed side by side with the piston-rod of each steam cylinder connected by a lever to the slide valve of the adjoining steam cylinder, so that the movement of each piston instead of operating its own slide valve, as in the simplex pump, operates the slide valve of the adjoining cylinder. The valve motion is so adjusted that just before the piston of one cylinder has finished its stroke, the piston of the other begins its movement. The load of the water column is then taken up alternately and produces a steady flow without serious strains, harshness of motion and noise, which characterize the action of the simplex pumps, in which the water column is started into motion at the beginning, and arrested at the end of each stroke of the piston. Although the simplicity of their mechanism, together with the cheapness of their first cost and the certainty of their action, placed them at the head of all the machines of their class, when considered from a mechanical standpoint, the loss of economy in the use of steam continued to militate against their general use for heavy duty purposes. Their light weight prevented the cutting off of the steam in the steam cylinder so as to complete the stroke of the piston by the aid of the expansive energy of the steam thus cut off. Therefore the steam applied to move the pistons had to be applied in sufficient quantity and pressure to overcome the weight of the water column and its friction through the pump and connections, at the very beginning of the stroke, and maintained without diminution throughout the stroke, up to its termination, since a falling off in either volume or pressure during any part of the stroke would have stopped the action of the pump instantly. This defect, however, was completely eliminated by applying to them the principle of multiple expansion in the use of steam in compound condensing steam engines. Another steam cylinder was added to the end of the one already in use, and placed in a direct line with it so that the high pressure steam admitted to the first and smaller cylinder, after moving its piston, was exhausted behind the piston of the large cylinder upon its return stroke. Still further economy was produced in the larger compound engines by using a condenser to create a vacuum in the large steam cylinder, thus bringing the efficiency fully up to that of the best high-duty rotative engines of the most important pumping plants of the world with yearly records ranging from a duty of 50,000,000 to 120,000,000 foot-pounds per 100 pounds of good coal.

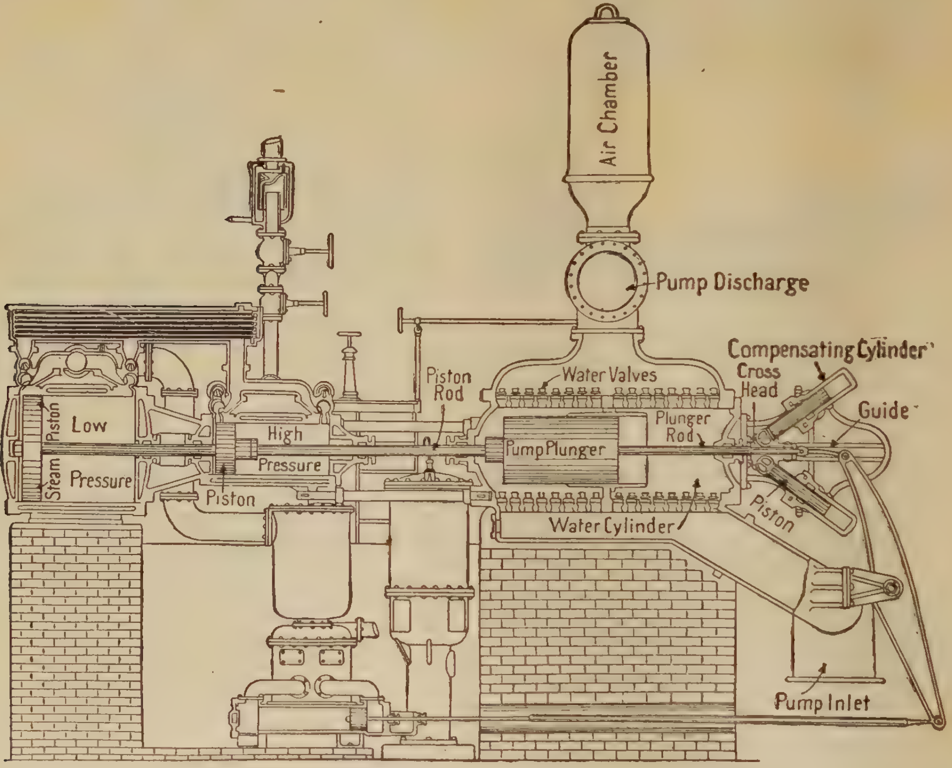
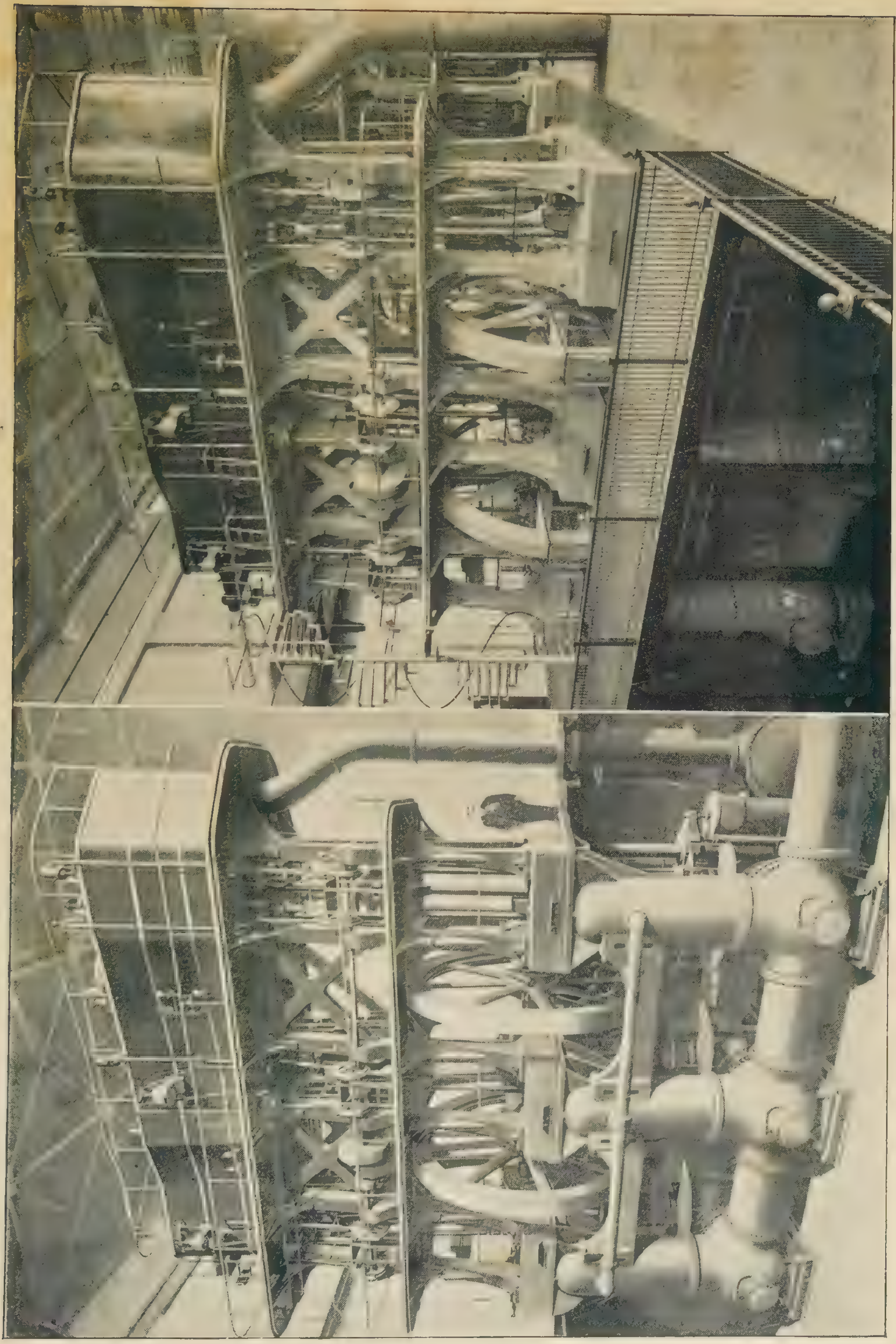


FIG. 11.—Sectional View of Worthington High Duty Pumping Engine.

The duty of the Worthington pumping engines was still further increased, and the entire arrangement, from the power-producing to the pumping ends, was made to represent the highest perfection of modern pumping machinery, by the application of the accumulator, a device originally invented by J. D. Davis, in 1879, and perfected by C. C. Worthington, in 1884. With it the steam may be cut off in the steam cylinder soon after the beginning of the piston stroke, a part of the power being stored and brought into play toward the end of the stroke so that the force exerted upon the pump plunger remains uniform through the entire stroke. In a compound direct-acting steam pump, the device is attached to the plunger-rod which is extended for this purpose through the outer end of the pump chamber. On the end of this rod is fastened a cross-head which moves in guides attached to the outer end of the pump. On this cross-head, and situated opposite to each other, are two hemispherical recesses. On the guide plates are two journal boxes, one above and the other below the plunger-rod, equidistant from it, and placed at a point equal to the half stroke of the cross-head. Each journal box carries a short cylinder hung on trunnions, which allow the cylinder to swing in unison with the motion of the plunger rod. In these cylinders are plungers or rams, which pass through a stuffing box on the end. The outer ends of the rams have rounded projections which fit into the recesses on the cross-head, which is moved in and out with the plunger, thus tilting the cylinders backward and forward. These cylinders are called «compensating cylinders.» When the engines are used for pumping water, they are filled with water, and when used for pumping oil, they are filled with oil. The pressure on their rams is produced by connecting the cylinders through their trunnions which are hollow, with an accumulator, carrying a ram which moves up and down as the rams of the cylinder move in and out. This accumulator is of the differential type, the small lower cylinder of which is filled with water or oil, in which the ram moves, while the larger upper cylinder is filled with air. On the top of the accumulator-ram is a large piston-head which



Views of Large V.T.E. Pumping Engines installed for City of Cleveland, Ohio, by Allis-Chalmers Manufacturing Company

fits closely in the air cylinder. Therefore, the pressure per square inch on the accumulator-ram and also in the compensating cylinders is equal to the pressure of the air in the air cylinder per square inch multiplied by the difference between the area of the air piston and that of the accumulator-ram. It is a matter of calculation and construction, which varies according to the particular service for which a pumping engine is designed; while the pressure in the air cylinder is controlled by the pressure in the main delivery pipe with which the air chamber is connected. The effect of this attachment on the successful operation of high duty pumping engines may be briefly described as follows: At the beginning of the outward stroke of the pump plunger-rod, the compensating cylinders point inward toward the pump, with their rams at an acute angle with the plunger-rod, and opposing its advance with the full pressure of the accumulator load. As the plunger-rod advances outward, the angle between itself and the ram is increased gradually to 90 degrees. The rams recede into their cylinders, and their pressure against the rod is decreased until the pump plunger-rod has reached the halfway point of its stroke, when the rams will be at right angles to it — a position in which they neither retard nor advance its movement. As the pump plunger-rod continues on its outward stroke, the angle between itself and the rams is again decreased, but now the rams, pointing in the opposite direction, emerge from their cylinders, and exert their power to push the plunger onward to the termination of its outward stroke. It is obvious that similar conditions obtain during the return stroke of the plunger, the effect of the action being to store up power during the early part of the stroke, either forward or backward, when the steam is under its greatest pressure, and to release it at the end of the stroke, when the pressure in the steam cylinder has fallen away to its lowest point, that is, below the amount necessary to move the plunger against the pressure of the water column.

The Worthington pumps with this attachment and the use of multiple expansion steam engines operate with absolute freedom from the noise and shock so characteristic of the crank and fly-wheel machines.

For the sake of economy in floor space most high-duty pumps are built in the upright or vertical form, the steam cylinders at the top, and the pump cylinders below. With the exception of the Worthington, which still remains of tandem design, the high, intermediate and low pressure steam cylinders are set side by side in a rank. With the same exception also, most of the high-duty pumps are built to work on a crank shaft carrying fly-wheels, some of which are enormously heavy; weighing, for instance, in the Holly waterworks pumps up to 32 tons each, and each pump carrying two such fly-wheels.

The term «duty» represents the work done by a steam pumping engine expressed in millions of pounds of water lifted to the height of one foot by the consumption of 100 pounds of coal, 1,000 pounds of dry steam, or by 1,000,000 British thermal units (B. T. U.). On account of the variable quality of coal, the two last-named constants give the more correct results, and are the values now employed in determining the comparative efficiencies of pumping engines, which range from 20.6 per cent for the high-duty engines, to about 0.13 per cent for jet pumps. During the last 100 years, the development of pumping engines has increased their duty from about 5,000,000 foot-pounds for the Newcomen atmospheric engines, to over 170,000,000 foot-pounds for the crank and fly-wheel, or duplex triple expansion pumping engines of the latest construction.

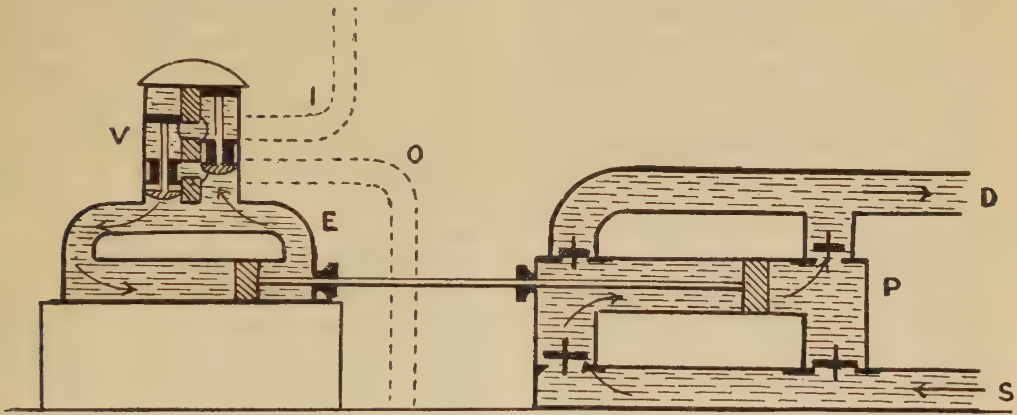


FIG. 12.—Pumps and Pumping Machines.

Somewhat of an idea of the difference between the first duplex Worthington pumping engines and those of their latest construction may be obtained by comparing that of the Charlestown, Mass., waterworks, with its capacity of 5,000,000 gallons per day, with the installation at the Baltimore, Md., waterworks high service pumping station, which delivers 18,000,000 gallons per day. The former gave a duty of 70,000,000 foot-pounds, while the duty of the latter exceeded 140,000,000 foot-pounds per 1,000 pounds of dry steam.

Hydraulic pressure pumps are designed as a rule for driving water into an accumulator, whence it may be drawn for power service in mains, or for use in hydraulic presses (q.v.), hydraulic cranes (q.v.), and similar machines.

The pumps which do this exceptionally heavy work are of the plunger type of direct-acting pumps, the plungers being very small — about one and one-quarter inches in diameter and of six-inch stroke, while the steam cylinders are of the usual size. The high and low pressure cylinders are commonly placed side by side and work upon a crank-shaft which carries a heavy fly-wheel. These pumps work up to 4,000 or 5,000 pounds per square inch.

In all reciprocating pumps, valves play an essential part. In the simplest forms the valves are made of leather or rubber, and are fixed in position by a hinge on the edge, generally, for the larger sizes, having a metal form which prevents too great relaxing. They are made in a great variety of forms and operate in response to certain pressure, or, as in the case of the Reidler valve, by mechanical means. They consist essentially of a «valve seat,» to which the «disc» or valve proper is attached, the «stem» which controls the lift of the disc and prevents its displacement from the seat, the «cover plate,» and the «valve spring,» introduced in some forms to take up slacks. When a valve is required only to prevent the back pressure or a reverse flow, a single flap or check valve is used. In large pumps a number of small valves are employed, equal in aggregate area to a single large valve of sufficient size to allow the passage of the whole flow, thus preventing injurious shocks when the valves are opened and closed suddenly, as all of the smaller valves do not close simultaneously but each as its critical pressure supervenes. Excepting the discs, all the other parts of a valve are made of bronze, while metallic ball and cone valves are extensively used in deep well pumps. A detailed description of the more commonly used valves will be found in the special article under the title VALVE.

**History.**— The raising of water for economical purposes dates back to the remotest periods. It is not easy to determine just when mechanical appliances worthy to be classed as pumps first made their appearance, and it has been the custom of some writers to dignify the common water-pail by the name of pump if only it were lifted by mechanical means — as, for example, with the old-time well-sweep. In this connection mention has been made of the «shadoof,» of Egypt, authentically recorded as having been in use over 1,500 years B.C., in the time of the Pharaohs, a period antedating the Exodus. It is still used extensively in that region, myriads of them lining the banks of the Nile, where they are worked unceasingly by relays of men, without intermission, day and night. It is also used extensively all over Hindustan, where it is called the «picotah.» In fact, the «sweep» in some form is used extensively in all of the Oriental countries from Asia Minor to China and Japan and also in Mexico and South America, for domestic purposes and for the irrigation of land. For the latter purpose, however, it was superseded in India by the «jantu,» an oscillating wooden trough involving the same principle, that of the lever, and worked by hand. The «windlass and bucket» arrangements operated by cranks or by tread-wheels, the latter worked by men or animals, appear to have followed the «sweep,» first among the Chinese, and later among the earliest Greeks and Romans. About the beginning of the Christian Era, Vitruvius, a Roman engineer, described a number of pumping machines involving a rotary principle — the «tympanum,» «noria,» «chain of buckets or pots,» the «screw» and the «pump.» The tympanum consisted of a series of gutters with their open ends joined to a shaft hollow at one end and placed above the surface of the water at the height to which the water was to be elevated. The gutters thus arranged radially extended to a short distance below the surface of the water which they scooped up successively when the shaft was rotated. Each gutter as it passed above the horizontal position delivered its water to the shaft to be subsequently discharged through a trough at the desired point. This primitive device continued in use from the remote ages of antiquity up to the 18th century without any change of construction, when La Faye, a member of the Royal Academy of Sciences of France, improved it by substituting a series of curved canals for the original straight gutters, thus developing the progenitor of the «scoop wheel,» which, propelled by streams, are extensively used for draining purposes. La Faye's improvement and the geometrical reasoning which developed it are exhaustively described by Belidor (Tom. ii, 385, 387). While the tympanum consisted of a series of revolving gutters, the noria may be described as a number of «sweeps» arranged around a central shaft like the spokes of a wheel, each carrying on its outer end a vessel which fills as the rotary motion of the shaft plunges it beneath the surface of the water, and subsequently discharges its liquid freight into a reservoir placed at the upper part of the circle. It is commonly known as the Persian wheel. The «chain of buckets or pots» was an elaboration of the simple bucket and cord arrangement, by the introduction of a pulley operating an endless rope or chain, to which several buckets or pots were attached. It was employed by all the foremost nations of antiquity, and is yet used in many parts of Europe and Asia. Among half-civilized nations it was the highest type of hydraulic machines. Sometimes, when the source of supply was a river, as in the case of the Persian wheels on the Orontes, the driving wheels of the arrangement were placed in the river and propelled by its current. About the middle of the 17th century, European mechanics recognized that when the water was admitted into the receiving vessels of a noria or a chain of pots at the upper part of the circumference, it was converted into an overshot wheel, thus affording a means of power transmission to other machines, and in cases where the water supply was limited, but descended from a considerable elevation, it was substituted for the overshot wheel as a prime mover in operating mining pumps, dredging, threshing and other machines of a similar character; while as a conveyor, originally used exclusively as a water elevator, it has also been employed to raise mortar in the construction of buildings, city walls and fortifications, and for carrying grain and flour to the different floors of a mill. In its original form, that of the «sakia» of Egypt, it was unquestionably the pump introduced into Greece by Danaus when he dug the wells of Argos, 1485 B.C., about a thousand years before the building of Babylon by the Persians. Danaus was a brother of the Pharaoh Rameses, who resigned during the period the Israelites were in Egypt. He was compelled to leave that country on account of domestic troubles, and accompanied by his family and friends sailed for Greece. They landed on the coast of Peloponessus, and settled at Argos. According to Pliny (vii, 56), previous to the arrival of these Egyptians, the Greeks were unacquainted with wells and pumps; therefore, it is natural to conclude that the wells of Argos dug by Danaus were equipped with the Egyptian pumping devices most adaptable to wells, which was the chain of pots, and not a form of atmospheric or force pump, the pioneer of which is described in Hero's ‹Spiritalia› as invented by Ctesibius of Alexandria, one of the most eminent mathematicians and mechanicians of that period, in the year 224 B.C. The most modern refinement of the chain of pots is the «chain pump,» while Vera's «rope pump» and the hydraulic belt are applications of the same idea, and consist of endless double bands of rope or woolen cloth passing over two rollers, one placed below the surface of the water, the other at the point of delivery. The rollers are driven at a velocity ranging from one to two thousand feet per minute, and as the bands pass over the upper roller, the water held between them by capillarity is forced out by the pressure and discharged into a receiving chamber connected with the delivery spout.

Water-raising machines embodying the principles of the screw, stated by some authorities as invented by Archimedes, the Greek geometrician and greatest mathematician of antiquity, and by others credited to the genius of Canon of Samos, a contemporary of Archimedes, about the year 242 B.C., are described by Vitruvius as of Egyptian origin, and were, according to other authentic records, employed in Egypt, for draining and irrigating land, many centuries before Archimedes visited that country. It consists of one or more flexible tubes of lead or leather, wound spirally around a solid cylinder of wood or iron, the ends of which are pivoted to supports, so that the whole arrangement may be revolved upon its axis, which is generally placed at an angle of 45 degrees to the horizontal. The lower end of the tube is placed below the surface of the water, and the upper end over a receiving trough at the desired elevation. When the machine is rotated the water entering the lowest bend of the spiral is forced upward by each succeeding revolution into the other bends, and finally discharged out of the uppermost into the trough. The Roman screws were made with plank grooves arranged spirally around a solid cylinder, and the grooved cylinder thus constructed was fitted into and revolved within a hollow cylinder of the same length. Thus foreshadowing the turbine pump of the present day.

The connecting link between the various more or less elementary forms of water elevators or «lifts» already described, and the group of hydraulic machines designated as «displacement pumps,» is the modern chain pump, consisting of a tube through which the water is raised by a series of pallets or pistons. The pump of Ctesibius appears to have been of this character, although it consisted of only two single-acting pistons working in a cylinder, the water being raised by the up-stroke and expelled by the down-stroke, into a common receiving chamber. In this machine the atmospheric pressure was not taken into consideration, and its capabilities as a water-lifter remained unrecognized until 1643, when Torricelli, the great Italian physicist, announced that water could be raised in a tube by the pressure of air. In 1641, Galileo, when consulted by a Florentine pump-maker, had failed to demonstrate why water failed to rise in a closed tube above a height of 33 feet under the action of a suction pump. A year or two later, after the death of Galileo, Torricelli undertook the explanation of that fact, his experiments finally resulting in establishing the law that the heights attained by liquids in a closed tube, the upper end of which was a vacuum, under the pressure of the atmosphere, was proportional to their specific gravities. For example, under these conditions, the height of a column of mercury would be about 28 inches, while that of a column of water would be about 33 feet at the level of the sea. The direct result of this experiment was the invention of the siphon barometer, in which the empty space above the column of mercury is known as the Torricellian vacuum; but the further experiments of Pascal, a French mathematician and divine, in 1646, followed by those of Otto Guericke, a philosopher and mathematician of Magdeburg, Prussia, and of Candido del Buono, a member of the Academie del Cimento of Florence, led to the invention of the «air pump,» an apparatus which is described under that title, and which must not be confounded with the atmospheric or displacement pump used for pumping water, which was not unknown to the ancients, and was probably used in some of its innumerable forms, long before the days of Ctesibius.

The expansive energy of compressed air, hot air and steam, was probably employed by the ancients as the motive power of pressure engines to raise water many centuries before the Christian era. There are extant numerous authentic descriptions of devices equipped with piston bellows, employed for this purpose by the ancient Egyptians, Hindus, Chinese, Peruvians and the Aztecs. Also descriptions of hot-air devices and pressure machines operated by steam, the majority of which were contrived by the members of the ancient priesthoods. A great many of these machines are described in the ‹Spiritalia,› written by Heron, or Hero of Alexandria, a celebrated Egyptian mathematician and physicist, who lived in the 1st century A.D. The water-jet apparatus known as Hero's Fountain, although asserted to have been invented by him, was probably an old device at the time he described it. In either case, it is the oldest pressure engine ever described accurately in which a volume of air was used instead of a piston. In 1560 Baptista Porta, an Italian, published a work entitled ‹Natural Magic,› in which he described a method of producing a vacuum by the condensation of steam, and its application to devices for raising water. Similar descriptions are given in the writings of Jerome Cardan, also an Italian, published some time between 1515 and 1570. Therefore, although nothing new was discovered by Decaus, whose writings were published in Frankfort in 1615 and in Paris in 1624, or by Fludd, Worcester, Savery and Papin, whose investigations and writings extended over the period from 1663 to 1698, the suggestions afforded by their experiments (subsequently elaborated by Freiburg in 1797 and Shone, Callon, Frizell and Pohlé in the period extending from 1870 to 1900) have led to the development of the various forms of modern air-lift pumps operated by compressed air and pulsometers operated by steam.

Although pressure engines operated by air compressed under a head of water, as suggested by Papin in 1695, had been employed successfully to drain mines as early as 1755, when Hoel employed one in the mines of Chemnitz, Hungary, the application of steam for that purpose did not become an accomplisheed fact until a much later period. It is, however, interesting to note that the idea was suggested by Lord Bacon prior to 1679, in connection with the English mines, and probably was practically applied to a limited extent about that time. The history of the modern pumping engine, however, more properly begins with the construction of the Cornish engine. Up to the close of the 18th century, the only practical use of steam engines was in connection with pumping devices, and many notable steam pumping engines had been erected and successfully operated in the mines of Cornwall, England. The various improvements made in this engine from 1800 to 1840 finally culminated in the evolution of one superior type which is now known as the «Cornish.» This engine gave highly satisfactory service for the particular purpose for which it was designed — the raising of water out of deep mines where the constantly increasing depth of the shafts necessitated the adaptation of the same engine to the consequent increasing and changing loads. It is constructed upon the principle that the steam within the steam cylinder is used to lift a weighted pump plunger which after being raised upward to the limit of its stroke, descends slowly by its own weight and forces upward a column of water equal to that weight. The economy produced by the expansion of the steam in the steam cylinder when the steam is cut off during the descent of the plunger is due to the fact that the pressure and power of the steam first admitted is greatly in excess of what is necessary to lift the weighted plunger. This excess of power is taken up by the weights of the plunger at the beginning of its stroke and given out at the end when the power of the exhausted steam in the cylinder has fallen below the amount necessary to move the plunger, unless assisted by the power previously stored in it. The length of the stroke of the piston and of the plunger being determined solely by the operation of its steam, equilibrium and exhaust valves, it is absolutely necessary to maintain the steam pressure at a uniform rate, while the water raised must be received under a uniform head. In mine pumps the steam cylinder is placed at the top of the shaft, and the pump at the bottom, near the surface of the water. The steam piston is connected to the pump plunger by a beam made of heavy timbers, the weight of which, together with that of the weight of the plunger, forms the weight which, after being lifted by the steam cylinder, raises an equal weight of water when the plunger descends.

In order to preserve the proper relation between the weight of the pump rods and plunger, and that of the water columns, and also keep the engine and pump at the proper speed, by maintaining the proper difference in the weight of the pump rods so as to overcome the friction of their guides, and that of the water in the delivery pipes, a large box, called the «balance bob,» in which the adjusting weights in the shape of stones or pieces of iron are placed, is attached to the upper end of the pump rods. When the shafts become deeper and require the lengthening of the pump rods, the additional weight of the new timbers is counterbalanced by a readjustment of the weights in the «balance bob,» thus adapting the engine to the new conditions. In its particular field of application, requiring only a slow action with no demand for continuous flow, it is safe to state that it has never been excelled by any other engine; but, its inordinate size, its action which requires the constant watchfulness of the engineer, its great first cost and expensive repairs, makes it unfit for waterworks, where the water has to be discharged through a long main to a great height above the pump, with a continuous and uniform delivery. The shortcomings of the Cornish engine, named above, led finally to its complete abandonment for waterworks, and called for a pumping engine that would fulfill the new requirements. This demand was met by the development of the «rotative» engine which, by employing revolving instead of reciprocating pistons, gave a positive motion. The steam power in the cylinder is applied to the pump piston in various ways — through the medium of long or short beams, bell cranks or gearing, and in some instances directly through the pistons themselves; in all cases, however, the limit of the stroke of the steam piston and of the pump plunger being governed by a crank on a revolving shaft. Attached to this shaft is a fly-wheel which is designed to assist the crank to pass the centre at each end of its stroke and also to give up at the beginning of each stroke of the steam piston the excess of power imparted to it beyond that required to move the column of water. The function of the fly-wheel of a rotative engine is exactly similar to that of the weighted plunger in a Cornish engine; both of the devices being applied to their respective classes of engines to obtain the best economy in the consumption of steam, the early cut-off resulting in a high grade of expansion, much higher than it was possible to obtain by any other means at the time. They vary greatly in design and in the details of construction, and are made in sizes ranging from those used for supplying water to small towns, up to some of the largest and most expensive machines in the world, and operate either vertically or horizontally. They produce great economy in the use of steam at the expense of intricate machinery, but require expensive and massive foundations to absorb the shocks produced by their operation, while the momentum of the fly-wheel greatly increases the percentage of possible accidents.

To follow further the progress of pumping-engine construction up to the invention and development of the «direct-acting steam pumps,» which now represent the highest type of pumping machinery, it is necessary to take up the historical thread in the United States. Although steam pumping engines of the direct-acting type, beginning with the device invented by Thomas Newcomen and John Cawley, of Dartmouth, England (which was subsequently improved by Watt, who developed it into an engine of the double-acting type), were in great use for many years; the greatest improvement in this class of pumping engines was made by Henry R. Worthington of New York in 1840. His invention was the outcome of a long series of experiments on the application of steam to the propulsion of canal boats. It was a single direct-acting steam pump and was employed to feed the boilers of his propelling engine, and was patented for the first time in 1841. Although steam pumps of this type came immediately into extensive use for feeding boilers and for supplying moderate quantities of water under medium pressure, the intermittent action of their pump pistons and consequent irregular flow of water prevented them from being used in waterworks and for other purposes where large quantities of water had to be forced through long lines of pipes. To overcome this serious defect the same inventor produced the improved pump which is now generally known by his name.

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Revised by Richard Ferris.

**PUN,** a play upon words alike or similar as to sound, but different as to sense. The pun has been familiar to all literatures, and in ancient times was used even in serious context. This was true also in England of the 17th and 18th centuries. Puns are met with in the tragedies of Shakespeare; in the works of the quaint Fuller; in the discourses of Bishop Andrews. The divines of colonial America did not lack for them. Mathey Byles won his reputation for wit chiefly through the appositeness and felicity of his puns. Thus, being a sturdy loyalist, he was for a time kept under surveillance by a sentinel whom he called his «observe-a-Tory.» A parishioner called upon him and Byles, noting his ulcerated jaw, sent him to Copley, the artist, to have his tooth drawn. Among famous English punsters may be cited Sydney Smith, Lamb, Theodore Hook, Wilberforce and, above all, «Tom» Hood, most inveterate and happy of the coterie, who even remarked of a certain undertaker that he appeared anxious to «win a lively Hood.» The pun has frequently been derided as an unworthy form of wit. John Donne is reported to have said that «He who would make a pun would pick a pocket»; and Holmes, in the ‹Autocrat,› after denouncing verbicide, gives a pyrotechnic display of excellent puns. It is true, however, that the pun has found advocates in divines, philosophers, statesmen and literati. Many puns convey a weight of meaning which could hardly be secured by sentences of paraphrase.

**PUNCH,** a well-known English comic weekly, the most famous journal of the kind. The success of Philipon's Paris *Charivari* induced a staff of several Englishmen — some, as Douglas, Jerrold, Thackeray and John Leech, since famous — to organize for the publication of a *London Charivari,* of which whole pages of text had been set up, when the scheme collapsed. This undertaking had, however, some indirect influence on the subsequent *Punch.* The idea of *Punch* appears to have been due originally to Ebenezer Landells, a Northumbrian wood engraver and draughtsman, and to have been developed by Henry Mayhew, a brilliant humorist of the time. «Mr. Punch» was the traditional jester of the puppet-show transformed into «the laughing philosopher and man of letters; the essence of all wit, the concentration of all wisdom.» As finally agreed, Mayhew, Mark Lemon and Stirling Coyne were to be coeditors, Landells was to find drawings and engraving, and Douglas Jerrold and Gilbert à Beckett were to be among the outside contributors. The first number appeared on 17 July 1841. In two days two editions, each of 5,000 copies, were sold out. After some early vicissitudes, *Punch* became an English institution. A list of its writers and artists includes many famous names besides the jovial Lemon and the caustic Jerrold; Thackeray, «Tom» Hood, Charles Lever, «Tom» Taylor, Cuthbert Bede, Horace Smith, Shirley Brooks, F. C. Burnand, Artemas Ward, G. A. Sala, H. W. Lucy, John Leech, H. K. Browne («Phiz»), Sir John Tenniel, George Du Maurier, Stacy Marks, Sir John Millais, Linley Sambourne and others. The editors have been Mark Lemon, 1841–70; Shirley Brooks 1870–74; «Tom» Taylor, 1874–80; Sir F. C. Burnand, 1880–1906; and Owen Seaman, 1906—. *Punch* has done much to laugh out of court various shams, fads, affectations and forms of ostentation. In British politics it has remained wholly free from party bias. The present application of the word «cartoon» originated with *Punch,* the occasion being the first great exhibition of cartoons for the Houses of Parliament (July 1843), when Mr. Punch appeared with a rival series of sarcastic designs. Consult Spielmann, ‹The History of «Punch» › (1895); ‹An Evening with Punch› (1895), selections from the first 50 years; à Beckett, A. W., ‹The à Becketts of Punch› (1903).

**PUNCH,** a beverage, commonly composed of wine or spirits, water, lemon juice and sugar, with occasionally an addition of some spice, as nutmeg or cinnamon. These are usually mixed in any desired proportions in a large bowl made for the purpose — hence called the punch-bowl. The beverage may be compounded as follows: Squeeze the juice out of three or four lemons, adding thereto the peel of one lemon cut in slices, 12 ounces of lump sugar and three and a half pints of boiling water; infuse this mixture for half an hour, then pour into the punch bowl, and add of rum and brandy rather less than a pint of each. Varieties of punch are called after one of their principal ingredients, gin, milk, orange, raspberry, tea, wine, etc. Punch was introduced into Great Britain from India, and it appears to be so called from the

Hindu *panch,* five, which is the usual number of the ingredients.

**PUNCH.** See METAL-WORKING MACHINERY.

**PUNCH AND JUDY,** in Great Britain and some European countries, a well-known puppet-show frequently exhibited in the streets. The show of Punch and Judy derives its origin from the Neapolitan Punchinello, but many of its features are purely English. The earliest account of the adventures of Punch and his wife, Judy, is found in a ballad, the date of which does not appear to be anterior to 1795. This account corresponds pretty closely with the representations given in our streets. The show embodies a domestic tragedy, followed by a supernatural retribution, the whole of which is treated in a broadly farcical manner. Punch himself is represented as short and thick-set, with an immense hump upon his back, a wide mouth, long chin and hooked nose, and wearing a three-pointed cap. His wife, Judy, who is in some respects his counterpart, and his dog, Toby, are important characters in the performance See also PUPPET-SHOWS.

**PUNCHEON,** a liquid measure of capacity containing from 84 to 120 gallons. See WEIGHTS AND MEASURES.

**PUNCHINELLO,** pŭn-chĭ-nĕl'ō (from *pulcinello*), an Italian mask or marionette. The Abbate Galiani derives the name from a misshapen but humorous peasant from Sorento, who had received it (about the middle of the 17th century) from his bringing chickens (*pulcinelle*) to market in Naples, and who, after his death, was personated in the puppet-shows of the San Carlino Theatre, for the amusement of the people, to whom he was well known. See also PUPPET-SHOWS.

**PUNCTUATION,** from the Latin *punctus,* «a point,» is the term used to designate the use of points, or marks, for the purpose of separating words from each other in sentences and parts of sentences. The convenience of such separation is obvious, yet for many centuries after writing had first been used there was nothing to indicate the pauses, or divide a book into sentences. No attempt to punctuate is apparent in the earlier manuscripts and inscriptions of the Greeks. It was in Alexandria that punctuation originated, when that city was the centre of ancient learning. The open space to the left of a line which indicates the beginning of a paragraph made its appearance on papyri at Alexandria. The early signs intended for punctuation were at first used in poetry only, to enable readers to comprehend the meaning hidden in obsolete words and involved and difficult verses. Ages passed, however, before any form of punctuation became general, and it was not until the 9th century after Christ that the division of sentences by period, colon and semicolon marks took place. The comma was the same as to-day, a large dot or double dot indicated the full stop, and a high dot stood for a colon or semicolon.

The following rules for the use of the points are condensed from De Vinne's ‹Practice of Typography.›

The chief purpose of the comma is to define the particles and minor clauses of a sentence. Reversed, and often in pairs, commas mark the beginning of a quotation. A reversed comma marks the abbreviation of Mac in Scotch names, as M'Carthy. Reversed commas in tables are a sign for ditto. The comma frequently supplies the place of omitted words, as in addresses.

The semicolon keeps apart the more important members of the sentence, and is most used in long sentences.

The colon is used after the particles or introductory words to another statement, as in to wit: viz: for example: Dear Sir: It is often used to separate hours from minutes, as 2:14, for 14 minutes past two.

The period marks the end of a completed sentence. It is also employed in abbreviations, as J. Smith, i.e., q.v., etc. It separates whole numbers from decimal fractions.

The dash has been substituted for almost all the points, being once much used to indicate suppressed words. It is employed to connect a side heading with the text that follows. It should be selected where there is an abrupt change in statement, as «Thus the plot thickens — but I weary you.» It serves to give additional force to an anti-climax: «They will steal anything, and call it — purchase.» The insertion of a comma before the dash is now regarded as unnecessary.

The parenthesis, usually shown in pairs, encloses the words added to a sentence, which would be complete without it. The bracket has similar uses, but is preferred when the words introduced are not by the author, but added as explanatory by an editor.

The interrogation marks the end of a question that requires answer. It is not needed when the question does not call for an answer, as «The Cyprians asked me why I wept.»

The exclamation marks a word or phrase intended to express great surprise or emotion; and is used also at the end of an exclamatory clause. «Look, my Lord! it comes!»

The apostrophe, most used to mark the possessive case, as in John's, is used also to show the contraction of words, or omitted letters, as h'd'k' for handkerchief, I'll for I will, and the clipping of words in dialect, as nuthin' for nothing. It is also used to mark the close of a quotation, single or double. For all nouns in the plural number that end in s, the apostrophe must follow to make the possessive, as boys' games; singular nouns ending in s call for 's, as James's book.

The first function of a hyphen is to mark the division of a word that carries into the next line, but it serves also to connect compounded words, as round-shouldered.

Consult Wilson, ‹Treatise on Grammatical Punctuation› (1850); Teall, ‹Punctuation› (1899); Cochrane, ‹Punctuation and Capitalization› (1908); Hart, ‹Rules for Compositors› (Oxford 1912).

**PUNDIT,** or **PANDIT,** an Indian title for men who devote themselves to the pursuit of learning, especially on religious subjects. It corresponds with the modern title of «Doctor.» It is especially applied to certain men who in the 19th century after being instructed by the English in the science of geodesy have explored and surveyed Tibet, and other areas of Asia generally inaccessible to Europeans. The most notable of them were Mohammed i Hamid, who went (1863–64) over the Karakoram Pass to the Yarkand River; the famous Naing Singh, who, between 1865 and 1875, brought back valuable results from his travels in Tibet, and discovered the northern springs of the Indus; Mirza Sudja, who (1868–69) crossed the Little Pamir to Kashgar and Ley; Haider Schah, who in 1870 made an expedition to Faizabad in the valley of the Oxus, and later explored the mountain ranges between Cabul, Bokhara and East Turkestan. Consult Garbe, ‹Indische Reiseskizzen› (1889).

**PUNIC** (pū'nĭk) **WARS,** in ancient history, the general name applied to three great wars between the Romans and the Carthaginians. The first (264–241 B.C.) was for the possession of Sicily, and ended by the Carthaginians having to withdraw from the island. The second (218–202 B.C.), the war in which Hannibal gained his great victories in Italy, was a death struggle between the two rival powers; it ended with decisive victory to the Romans. The third (149–146 B.C.) was a wanton one for the destruction of Carthage, which was effected in the last-named year. See Carthage.

**PUNICA.** See Pomegranate.

**PUNISHMENT,** in the strict sense of the term, is a definite expression of public indignation, at least conventional, if not genuinely moral. It always aims, at least, at expressing the indignation of the social group, and in this resides the fact that it is only externally similar to the earlier custom of revenge which, theoretically, is private. Public indignation, like non-moral resentment, or revenge, is a reactionary state of the group consciousness directed toward the cause of inflicted pain or other injury. And even punishment is, as in the cases of blood-revenge, frequently indiscriminate. In these cases punishment not infrequently falls on the relatives of the culprit. The nature of punishment necessarily involves suffering in the form of pain or loss of honor, place, power, liberty, property or even life. It implies forfeiture of what would otherwise have been admitted to be a right inhering in the sufferer, who suffers because he has perpetrated a wrong. The common will is not, as Rousseau informs us, «the sum of the individual wills.» The common will is the product of social life, and it is the will of establishing the solid foundations of peaceable interrelations among the members of a community. There being a stern necessity of social bonds under penalty of extinction to the whole community, the common will develops a most powerful tribal conscience demanding universal obedience to certain general rules called laws. All the citizens of a community may well be said to agree in this, that everybody regards himself as exempt; wherever there are laws all know there are some who will disobey them. The primary object of punishment is in every instance to maintain or restore the common will or social order. Our legal system in all its parts is a virtual confession of man's incapacity for individual self-government. «It is when a man can do as he pleases,» says Huxley, «that his troubles begin.» Statutory law is the will of a nation published in written and enduring form for the information of those subject to it. And yet after everything is done that can be done to instruct people as to what the public good requires, we always find two classes: those who abide by the demands of the public will, and those who do not. How shall the state treat those who wilfully violate its statutes? What shall be done with those who are both mentally capable of understanding its demands and who are physically able to conform to them, but still act directly counter to their requirements?

Such questions have been asked since man became a member of society: and the answer given was, punish them, or «cure» them. Such was the origin of punishment. The advocates of this treatment of public offenders saw its justification in many principles. Some saw in punishment a vindication of the law; others protection (which too often is inspired, however, by mere revenge and forgetful of the fact that two wrongs do not make a right); «example» was the purpose of still others (but these not seldom revealed an inclination to ignore all sense of proportion, and the degree of guilt); a recent development is the idea of reformation. Of all the foregoing, the notion of making an example is perhaps the least worthy, being an (unconscious, it may be) expression of mere vindictiveness. It is alleged to be a deterrent theory. Could the infliction have any deterrent effect at all upon just people unless it was supposed that the person punished was receiving his actual deserts? Reflection will, we feel certain, teach anyone that punishment out of all proportion to the degree of guilt would have just the opposite effect upon the just if they thought otherwise.

In every society the traditional notions as to what is right and wrong, obligatory or morally indifferent, are all too commonly accepted by the great majority without any further reflection. At their source not a few of these notions have their origin (sociology shows this) in sentimental likings and antipathies. The moral estimate all too frequently survives the cause from which it sprung; and no enlightened judge could fail to see that while this is so, the operation of «example» as a punitive principle would lead to flagrant injustice, for many times the moral estimates that come down to us from our fathers have no foundation in existing conditions.

Considered etymologically the word punishment would, it was hoped, throw some light upon what was uppermost in the minds of its advocates through the ages. That etymology is as follows: Punishment derives from Old French *punir,* which in turn comes from Latin *punire,* to punish, from *poena,* punishment, expiation, pain; and this is from the Greek ποινή (poine), meaning quit-money or fine for blood spilled. The Greek word finds its *cognate* in the Sanskrit *Ki,* to repay, which is related to the Zendish *kitha,* penance, and *kœna,* vengeance; these Aryan words are related to the Slavonic *cena,* a price. But valuable as these suggestions are one cannot expect, as Professor Wundt observes, to find much help from etymology; for «the phenomena of language do not admit of direct translation back again into ethical processes. The ideas themselves are different from their vehicles of expression and here as everywhere the external mark (or word) is later than the internal act for which it stands» (Wundt).

Remembering all this, it may not be far out of the way to admit that punishments should be graduated according to the degree of harm of an offense to society and according to the attractiveness of the offense to the offender; and not out of a desire to set an example. Its intrinsic object is to remove the «sin» not the «sinner,» but the cause of danger and of pain.

Punishment, in Western countries and nowadays, is seldom applicable to civil actions though these also are followed by compulsory payments of moneys, or failing this, by deprivation of property, liberty, etc. As the legal consequence of crimes, however, punishment consists chiefly of infliction of pain on the body; and this ranges from capital punishment, or death, down to imprisonment. In some instances whipping is added; and formerly in military and naval offenses, flogging. In crimes of lesser degree, imprisonment or penal servitude for a term of years is the punishment.

Since very early times a constant change in the treatment of punishment has been going on in civilized states. Its treatment may be divided into two parts; in the first place there is detection, arrest, trial and acquittal or conviction; in the second, treatment of the criminal after conviction. The acquisition by the state of the power to dispense justice and to make and enforce law is one of the greatest events in the whole of human history. It is the treatment of criminals after conviction that concerns us chiefly here; but as this *penology* can scarcely be understood in its development without taking into consideration the other division of the treatment of crime, called criminal procedure, we will approach it from this point of view.

The original motive in the treatment of offenders was that crude vengeance, the usefulness of which in maintaining the instinctive idea of order in primitive societies has been often studied by sociologists. The danger of free vengeance is not alone that the injured may wreak out atonement upon the innocent, but also that the infuriated avenger will limit the punishment he inflicts only by the degree of bitterness and hate he personally feels. In this way the original culprit feels that the vengeance he has felt (and his friends join him in his feeling), that the excessiveness of his suffering, now invites him to retaliate. Thus matters tend to grow worse and worse; and soon family and clan are embroiled in a permanent and destructive feud. Then a want clamors for relief. It grows into a demand and the demand finds a spokesman for reform in the person of a chieftain or other leader. For the hopeless tendency to engender feuds leads to reforms by which the chieftain seeks to suppress private revenge. Then «Vengeance is mine, I will repay» is the claim of the savage ruler. It is at this point that we find the emergence of a primitive criminal and civil procedure in all peoples that have risen out of savagery to barbarism, and the earlier stages of civilization, for it is here that the offended party goes before a judge to demand vengeance against his adversary. The purpose of this primitive court is to inflict such penalties that the injured party and bystanders will feel that justice has been done, so that these persons will be content to abstain from private revenge. Retributive justice means just such severity as group consciousness at this low stage of progress can witness with satisfaction. Next cupidity is pitted against hate, for the influence of authority is in favor of substituting redemption for penalties that kill or maim the fighting men of the tribe; and thus is instituted the *compositio,* the *wergild* and other fines; that is where the complainant is willing and content to sell his right of vengeance.

Thus the realization of «right» is from the beginning a social function. The idea of right being incorporated in the chieftain played an important part in bringing about the acquisition by the state of power to dispense justice; and moreover the religious tendencies worked to the same end. Wickedness was held to be an injury to the deity, whose anger would be visited upon the entire land; a conception that lasted far down into the Middle Ages, and according to which the fate of Sodom and Gomorrah was held to be typical of the effect of the curse from God. Already in primitive times religion led to a strange idea of justice; secret societies consecrated by the deity (Dukduk, Egbo) took upon themselves the function of enforcing «right,» instituting reigns of terror in their districts, maintaining order in society and claiming authorization from the god with whose spirit they were permeated. Later influenced by all these tendencies, the social aggregate took over the control of justice. It was already considered to be the upholder of right, the servant of the gods, the maintainer of public peace, the dispenser of sacrifices; and so the various elements conceived of as justice, which had previously been distributed among the single families, tribes, associations, societies, were at last combined and placed under state control.

Forms for the dispensation of justice judging of crimes, determining of punishments developed into judicial procedure, which for a long time bore a religious character. The Deity was called upon to decide as to «right» and «wrong.» Hence those terrible judgments of God through trial by water, fire, poison, serpents, scales, combat or decision by divining eye, so closely allied to the so-called trial by hazard. The cruel mal-treatment of elderly people suspected of witchcraft in early New England is familiar to all. A peculiar variety of ordeal is that of the bier, according to which the body of a murdered man is called into requisition, the soul of the victim assisting in the discovery of the murderer. An advance in progress is the curse, which takes the place of the ordeal. Thus arise those ordeals by invocation and by oath with *compurgators.* Witnesses succeeded to conjurors; divining looks were replaced by circumstantial evidence; and instead of a magical, a rational method of obtaining testimony was adopted. This development was not attained without certain attendant abuses; and the abolition of ordeal by God was among many peoples, notably among the inhabitants of eastern Asia, some tribes of American Indians and the Europeans of the early Middle Ages, succeded by the introduction of torture! Years ago August Comte maintained that the institution of slavery was the greatest single step up to his day in the progress of human culture, since it superseded a great amount of slaughter, with or without cannibalism. The practice of eating the criminals, which is quite a common form of cannibalism, seems to be largely due to revenge or indignation. In Lepers' Island, in the New Hebrides, the victims of it were not generally enemies who had been killed in fighting, but it was a murderer or a particularly detested enemy who was eaten in anger and to treat him ill. In many lands torture stood in close connection with the judgment of God. That this is so is no more remarkable than the fact that religious intolerance which accompanied the rise of monotheism was the result of the nature attributed to its God. Torture in other cases originated either directly or indirectly from slavery. To obtain evidence by torture the accused person was forced through physical suffering to make disclosures concerning himself and his companions; and in case he himself was considered guilty, to a confession.

The development of Hebrew teaching on the subject will reveal the stages through which the notion of «justice» passed. First there is the injunction to moderate vengeance and *lex-talionis* appears with its demand for an «eye for an eye.» Second, we must leave vengeance to rulers. And lastly, «love your enemies, do good to those who despitefully use you, forgive as you hope to be forgiven.»

Retaliation is finally seen to be a continuation of a moral disease; not a cure. The idea of loving one's enemies is found in the books of Saint Matthew, Saint Luke and Saint Mark; Lao-Tsze and Mang-Tsze voiced these sentiments in ancient China; we find them expressed in the Brahman Laws of Manu; Buddha taught that the hatred and revenge is not appeased by hatred (it ceases by non-hatred only); we find the same notion in Leviticus, Plato, Pliny and Epictetus, taught it to the classical world; and in the same spirit Jesus taught in His Sermon on the Mount;

«Ye have heard that it hath been said: An eye for an eye, and a tooth for a tooth: But I say unto you, That ye resist not evil.» We only point out the truth of the sentiment which prompted these sayings and which should be expressed in the sentence: «resist not evil with evil.» Evil must be resisted; but we must not retaliate. The rule of retaliation and the rule of forgiveness are not so radically opposed to each other as they appear to be. What the latter condemns is in reality not every kind of resentment, not impartial indignation; but personal hatred. Jesus himself certainly was not free from righteous indignation. Moreover the belief in a transcendental retributive justice, in an ultimate punishment of badness which we meet with in Taoism, Brahmanism, Buddhism and Christianity, side by side with the doctrine of forgiveness is founded on the demand that wrong should be resented. What is taught by all the great teachers who have been mentioned is good will to the good and to the bad alike. This is based on the consideration that all creatures, both good and bad alike, are ultimately products of circumstances; and, therefore, that the bad deserve compassion, not hatred. A novelist (George Eliot) has told us that it was the «illusion» of one of her characters that he trusted «in his own skill to shape the success of his own morrows, ignorant of what many yesterdays had determined for him beforehand.» The modern Italian school of criminology strikes this note again and again; it is a diapason whose slow and solemn vibrations, communicated to their own meditations, all readers of the literature of the new criminological determinism of Italy, will recall.

The laws of ancient Rome still command respect and in cases obedience in many civilized communities. We note the following punishments meted out to the offender in ancient Rome: There was the *mulcta*, or fine; *vincula*, imprisonment or fetters; *verbera*, or stripes; *talio*, or infliction of punishment similar to injury, limb for limb; *infamia*, public disgrace, by which the delinquent, besides being scandalized, was rendered incapable of holding public office and deprived of other privileges of Roman citizenship; *exilium*, banishment (*aquae et ignis interdictio* accomplished this); *servitus*, or slavery; *mors*, death either civil or natural (banishment and slavery are civil death). Natural death was brought about by beheading, scourging, strangling or throwing the criminal headlong from the Tarpeian rock, or from the place in a prison, from the Robur. Many have been the changes. Capital punishment has ceased to be a retaliation and has become more and more a mere protection against the repetition of a crime. As it would be wrong to leave a tiger abroad so a man who by his very nature is a murderer should not be allowed to remain at liberty. Since imprisonment is on the one hand not a sufficient guarantee for the safety of society and on the other hand is perhaps a more cruel treatment than death, capital punishment remains, under our present civilization, still a necessity of our penal code. Yet in all this the attempt is no longer made, to retaliate on the murderer the cruelties which he has committed; it is a maxim that the death punishment should be inflicted with as little pain as possible. The infliction of pain is not an act which men now regard with indifference, even in the case of the criminal, and to many enlightened minds it has appeared both unreasonable and unjust and cruel that the state should wilfully torment a criminal to no purpose. But while retributive punishment has been condemned, punishment in a new sense has been defended and looked upon in a different light, not as an end in itself, but as a means. It is to be inflicted not because wrong has been done but in order that wrong may not be done. Its object is held to be either to deter from crime or to reform the criminal and by means of elimination or seclusion to make it impossible for a criminal to commit fresh crimes. In the case of capital punishment the criminal is simply no longer allowed to live and it has ceased to be a revenge or retaliation. It has become a cure founded on the experience that a man who committed one murder is likely to commit a second murder. Hence a man who has killed another not on account of his innate or inbred murderous inclination, but through the unhappy complication of circumstances (under an unwritten law), will not be treated as an habitual murderer; and according to the laws of all civilized countries is not punishable by death.

Behind bars no criminal ought to be pampered, but should receive prison fare and prison treatment in accord with the regulation of the place where his deeds have brought him. For all this is curative. An execution for murder is merely the removal of a dangerous member from society and this for the same reason that a limb of the body infected by incurable disease must be amputated. Some recent tendencies by some well-meaning people are so naïve that one is tempted to call them childish; the conventions of society cannot be abandoned to alleviate the sufferings of criminals. To do so would be to act about as logically as it would be to abandon all medicine that leaves a bad taste in a patient's mouth. At the same time most lawyers might well remember that life is preferable to rules of health and that not a few of our laws are capable of becoming outgrown. Our penal laws are not as yet fully adapted to the new view. All our minor punishments are still retaliatory, which fact makes our prisons all too frequently breeding places of crime and vice, instead of what they ought to be, namely, moral hospitals. Perhaps a just test of any penal system is to be found in the quality of discharged convicts, and according to Mr. Eugene Smith, president of the Prison Association of New York it is a notorious fact that the most desperate class of criminals consists of discharged convicts.

**PUNJAB**, pŭn-jäb′, or **PANJAB** (Persian, «Five Waters»), an extensive territory in the northwest of Hindustan, formerly under the dominion of the Sikhs, but in 1849 annexed to British India. It is so called from its position, being intersected by the five great rivers which unite to pour their waters into the Indus. In 1901 the northwestern part of the Punjab was separated to form a chief commissionership under the government of India (see NORTHWEST FRONTIER PROVINCE). The lieutenant-governorship as thus limited is bounded on the east by Kashmir, Tibet, and the river Jamna; on the south by Sind and Rajputana, the river Sutlej being in part a boundary river; on the west by Baluchistan and Northwest Frontier Province; on the north by the Northwest Frontier Province. For administrative purposes it is divided into divisions (Jalandhar, Lahore and Rawal Pindee). Lahore is the capital, while Amritsar, the sacred city of the Sikhs, is the next largest city, since Delhi has been detached. Simla, the mountain capital, is within the province, and is the residence of the viceroy during the hot season. Murree is the summer headquarters of the military command. The total area of the province is about 95,000 square miles, with a population of about 19,974,956. The area of the Native States is 38,299, with a population of about 4,250,000.

**General Description.**— The province of the Punjab is a triangular tract of land between the Sutlej and the Indus, and, with the exception of the hill country on the slopes of the Himalayas, it is a great alluvial plain. On the northeast side is the margin of the Himalayas, on which there are beautiful sanitaria, or hill stations — Simla (the mountain capital of India), Dagshai, Sabathu, Kassauli, Dharmsala, Dalhousie and Murree, the military headquarters of the province. The country between Jhelam and the Indus is known as the salt range, as it contains inexhaustible mines of rock salt which have been worked for many centuries. It is abundantly irrigated by six rivers. These rivers (proceeding from west to east) are the Indus, the Jhelam (ancient *Hydaspes*), Chenab (ancient *Acesines*), the Ravi (ancient *Hydraotes*), the Beas (ancient *Hyphasis*) and the Sutlej (ancient *Hesudrus*). The Jhelam and Chenab unite their waters, and then are joined by the Ravi; the united stream is then augmented by the Sutlej, which has previously received the Beas. The combined waters of these rivers form the Panjnad, which joins the Indus near Mithankot. The rivers of the Punjab divide it into five districts, or *doabs* (countries between two rivers): namely, the Sind-Sagar Doab, between the Indus and Jhelam; the Jech Doab, between the Jhelam and Chenab; the Rechna Doab, between the Chenab and Ravi; the Bari or Manja Doab, between the Ravi and Beas; and the Jallandar Doab, between the Beas and Sutlej. Of these the first is by far the largest, but also the most sterile and least inhabited, abounding with bare eminences and rugged declivities, interspersed here and there with rich and fertile valleys. The second is mostly level, and has been described as «a sterile waste of underwood,» the abode of shepherds, and scantily irrigated; the Rechna Doab is bare and neglected, though susceptible of high cultivation; the Bari Doab, though bare, has a large surface under cultivation, and is the most populous and important of all, containing the large towns of Amritsar, Multan and Lahore; while the Jallandar Doab is highly cultivated, well peopled and excelled in climate and productions by no province in India. Speaking generally, the plains east of Lahore are the most fertile, wealthy and populous of the province, and the granary of the Punjab; while those on the west present a striking contrast. The soil of the level country varies remarkably from stiff clay and loam to sand, mixed with each other in variable proportions, and with vegetable matter; besides which, carbonate and sulphate of soda are sometimes mixed with it in such quantities as to render the land almost worthless. The mineral wealth of the Punjab is almost confined to its rich deposits of rock salt. The climate is hot and dry, and little rain falls, except in the higher country and under the influence of the southwest monsoon. The part of the province to the east of Lahore can be cultivated in most seasons without irrigation, but owing to this its crops are much more likely to fail from a deficiency of rainfall than those of the western irrigated tracts. The summer heat is very great, and in the early part of January sharp frosts are common.

**Vegetation, Agriculture.**— Wood is scarce, except upon the hills. In the west considerable areas are occupied by date-trees; and palms of other species, banyans and other trees are found here and there. The area under forests is over 4,250,000 acres. About 28,000,000 acres of the remainder are under cultivation, and over 20,000,000 acres more are available for cultivation. The principal grain crops are wheat, barley, rice, buckwheat and millet, pease, vetches and mustard; sesamum and other oil seeds, turnips, carrots, onions, cucumbers and melons. Indigo and sugar are exported. The tobacco plant grows luxuriantly, especially about Multan, and opium has been grown somewhat extensively. About 8,750,000 acres are under wheat, and over 750,000 under rice. The total irrigated area exceeds 9,000,000 acres, of which more than half is irrigated by canals. Among the fruits are the date, orange, fig, vine, apple, mulberry, banana and mango.

The livestock includes sheep, cattle, horses and camels; buffaloes are common.

**People.**— The population of the Punjab is composed of various races, the chief of which are the Jats, Rajputs and Pathans. The Jats form the bulk of the agricultural peasantry, and are tall and athletic, with handsome, open countenances, long beards and fine teeth. The people, generally, are in physical respects superior to those of Bengal. The native states subordinate to the Punjab government are 36 in number. Thirty-one are Hindu and five Mohammedan. The most important is Kashmir, the next Patiala. The Mohammedan state of Bahawalpur is the next followed in order by Kapurthala, Mandi, Sarmur, Faridkot and Malarkotla. The other states are insignificant in rank and consequence.

**Religion.**— The religion of the Sikhs, which is the national religion of the Punjab, was founded by Nānak, who was born A. D. 1469. The Golden Temple at Amritsar is the centre of the faith and the guardian of the sacred book known as the Adi Granth (see SIKHS). The distribution of the population according to religious profession is almost wholly Mohammedan and Hindu, there being some Sikhs, and a sprinkling of other religions. The American Presbyterian Board of Missions has important stations at Lahore, Ludianah and Umballa. Lahore is the seat of both a Church of England bishop and a Roman Catholic bishop. The Mohammedans form a very large part of the population of the Rawal Pindee and Multan divisions. The Hindus predominate in the easterly divisions and in the mountainous district of Kangra. The Sikhs reside chiefly in the centre and east of the province and constitute the mass of the gentry. The few Buddhists of the Punjab are almost entirely confined to the small Spito district in the extreme northeast. The Pathans and Baluchis are the most numerous of the Punjab Mohammedans by race, but the Mohammedan strength consists largely in converted Hindus belonging to the Jat and Rajput tribes. The Hindu Jats form a large proportion of the population.

**Language and Education.**— The chief languages spoken in the Punjab are Punjabi (known as Gurmukhi), Hindi, Sindhi, Jataki, Kashmiri, Pushtu, Persian and English. Since the country came under British rule elementary education has received much attention. The total number of educational institutions in the Punjab is about 8,000, with a total of over a quarter of a million scholars. Of the higher educational institutions of the province the following may be mentioned:— the Punjab University at Lahore; Lahore Government College; Oriental College; Saint Stephen's College, Delhi; Lahore Medical School; Saint Thomas College, Murree; the Khalsa College, Amritsar; Bishop Cotton School, Simla; and the Lawrence Military Asylum, Sanawar.

**Manufactures and Trade.**— The manufacturing industry of the Punjab is chiefly confined to the larger towns. Amritsar, Lahore, Multan and Shujabad are distinguished for their silk and cotton fabrics, and the silks of Multan called *kais,* and chiefly used for scarfs, possess a strength of texture and brilliancy of color for which they are much prized in the Indian markets. The shawls of Lahore, too, rank only second to those of Kashmir. Brocades, tissues and carpets, resembling the Persian, are also manufactured in the capital. In the east of the Punjab white cotton goods are prepared of a stronger and more durable texture, as well as cheaper, than those of British manufacture. The Punjab enjoys from its position an extensive transit-trade. The imports comprise sugar, spices and other groceries, dye-stuffs and cottons, woolen and silk fabrics, metals and metallic utensils, cutlery, precious stones, ivory, glass and cochineal, asafœtida, safflower, fresh and dried fruits, wool, horses, etc. The exports — partly of home produce, partly in transit — comprise grain, *ghee,* hides, wool, silk and cotton fabrics, carpets and shawls, raw silk and cotton, indigo, tobacco, hardware, horses, etc.

**Government and Revenue.**— The province is under a lieutenant-governor, assisted since 1897 by a legislative council of nine members. The most important item of revenue is the land-tax, which, on the average, yields a net revenue, after deducting charges, of nearly £2,000,000; besides there are excise duties on spirits and drugs, duties on stamps, etc. The financial condition is so favorable that there is often a clear surplus of revenue over expenditure of £2,500,000. About one-half of the whole cultivated area of the Punjab is tilled by owners, and about 1 per cent by tenants paying a nominal or no rent. Of the remaining area one-fifth is cultivated by occupancy tenants, and the rest is held by tenants-at-will, a class increasing in numbers from year to year. Rents vary from five annas to 40 rupees per acre, the average being about two and two-thirds rupees. On about two-thirds of the land held by tenants-at-will the rent is wholly or partly paid in kind, and the average rent payable in kind is for the whole province about two-fifths of the produce. Nearly 5,000,000 acres are under mortgage.

**Army and Police.**— The Punjab forms a military district called «The Northern Command,» under a lieutenant-general with headquarters at Rawal Pindee. The military authority of this officer extends to the Northwest Frontier Province. The military cantonments are Rawal Pindee, Peshawar, Noroshera, Abbottabad, Sialkor, Jhelum, Lahore, Jullundur, Sirhind, Umballa, Forozepore, Kohat, Bannu and Murdan under a lieutenant-general. The military force stationed in the Punjab in 1900 consisted altogether of 68,806 men. Of cavalry there were 11,893, of infantry 50,504, of artillery 6,120, with some engineers, etc. There were thus more troops in the Punjab than in any other division of India. The police force is stated to be in a most effective condition. It numbers about 20,000 men, divided into two divisions, the Trans-Sutlej and the Cis-Sutlej. Almost all the police are armed either with swords or guns. The Punjab has a chief court with five judges, two of whom are natives — and four temporary judges.

**History.**— The Punjab plays an important part in the history of Hindustan and British India. It was invaded in 327 B.C. by Alexander the Great, who defeated Porus at Mong in Gujerat and overran the whole country. In 1022 it was overrun by the troops of Mahmūd of Ghazni, whose successors held the country for 170 years, making Lahore the seat of their government. In 1193 it passed by conquest into the hands of Mohammed Ghori, and Delhi became the capital. After his death the country was ruled by a succession of turbulent chiefs, principally Afghans, till at length in 1526 Baber, the founder of the Mogul Empire, having obtained possession of the country, ascended the throne, and established a dynasty whose sway prevailed for about two centuries, during which the Sikhs were rising into importance. In 1738 Nadir Shah overran the Punjab, and in the following year he defeated the Mogul army at Karnal and sacked Delhi. The Sikhs were utterly defeated by the Afghan conqueror Ahmed Shah Durani in 1762, and the Moguls nominally ceded the Punjab to him. The Durani dynasty maintained its ascendency till the beginning of the 19th century, when the Sikhs under Ranjit Singh began their career of conquest. In 1818 this renowned chieftain stormed Multan and took Peshawar — in the following year conquering Kashmir and Derajat west of the Indus; and in 10 years he succeeded in establishing his power over the whole country. In 1839 Ranjit Singh died. His son Khorak Singh quietly succeeded, but died of a decline a few months after his father, on which Shere Singh, a natural son of the great Ranjit, assumed the sovereignty, but was assassinated 15 Sept. 1843. Dhulip Singh, the reputed son of Ranjit Singh, succeeded his brother. This young prince was converted to Christianity and retired on a princely pension to England, where he died. But from the close of 1843 to the period of its annexation to British India the government was in abeyance, or, what is worse, in the hands of an ignorant, bloodthirsty, rapacious and insubordinate army. At length it became manifest that the Sikhs of the Punjab were preparing for an irruption into the territories protected by the British on the east of the Sutlej. In the end of December 1845, the Sikh forces passed the Sutlej into the territories protected by the British, with a most formidable train of artillery, but they found themselves completely worsted after the hard-fought actions of Mudki, Ferozeshah, Aliwal and Sobraon. Lahore and other stations were afterward occupied by British troops: the Jallandar Doab, between the Sutlej and Beas, was permanently ceded to the British; and the province of Kashmir and the other provinces of the Himalayas were vested in the Rajah Gholab Singh. In 1849 a conspiracy between several disaffected chiefs and the Afgans resulted in further hostilities against the British, Multan being the centre of their operations. The indecisive battle of Chillianwalla was followed by the capture of Multan in January, and the victory of Gujerat in February 1849, since which period the former territories of the Sikhs have formed an integral part of the British Empire. The most important subsequent event in the history of the province was the Indian Mutiny, when the Sikhs were loyal to the British government, and the present Sikh regiments of the British native army form the most important section of the military strength of the empire, the Sikhs and the Gurkhas being esteemed by many critics the finest soldiers in the world. After the suppression of the mutiny the province was erected into a lieutenant-governorship under Sir John Lawrence, the distinguished statesman.

Bibliography.— Consult Cunningham, ‘Archæological Survey of India,’ Vol. XIV (London 1882); Gore, ‘Lights and Shades of Hill Life in the Afghan and Hindu Highlands of the Punjab’ (London 1895); Latif, ‘History of the Punjab from the Earliest Antiquity to the Present Time’ (London 1896); Medlicott, ‘Sketch of the Geology of the Punjab’ (Calcutta 1888); Prinsep, ‘History of the Punjab’; Griffin, ‘The Rajas of the Punjab’ (2d ed., London 1872); Honigberger, Thirty-five Years in the East’; Edwards, ‘A Year on the Punjab Frontier’; Clark, ‘Thirty Years of Missionary Work in the Punjab’; ‘Punjab Gazetteer’ (Calcutta).

**PUNJABI LANGUAGE AND LITERATURE.** Punjabi (also Panjabi from Persian *Punjaubi*—«Five Rivers») is an ancient Indian or Hindi dialect. Of a total population of about 26,000,000 inhabiting the Punjab (or Panjab) a large district in northwest India, some 18,000,000 to 19,000,000 speak Punjabi as their common vernacular; some 4,000,000 use Hindustani, the remainder speak the hill dialects; the Pahāri ȯ Hindustani is, however, employed in the law courts and officially in all intercourse with the natives. Punjabi has been enforced by many words borrowed from Persian and Arabic, and is, therefore, an Aryan language belonging to the central group. But the number of original Sanskrit words in its vocabulary (called *tatsama*) is small, especially when compared with Bengali and Uriya (two eastern forms of Hindi). Punjabi again has a number of dialects, fusing into one another, as is invariably the case with dialects throughout India. The main ones of these are Multani (in the south) which partakes both of Punjabi and Sindhi; next, Jathki (in the Centre) and Chibhali-Dogeri (in the north). There are also several alphabets in use, the most ancient of which is Gurmukhi, derived from the Dervanagari alphabet, a Sanskrit form, though somewhat altered, omitting also a number of signs. The Gurmukhi is likewise in vogue among the Sikhs. Then there is the Lundi alphabet, used for commercial purposes. However, the British government adopted the Arabic character, as being the most convenient for the purpose. There is really no literature in Punjabi, with the single exception of the Sikh Granths. Parts of the Bible, though, have been translated into Multani and Chibhali-Dogeri. The Sikh Granths in Punjabi, or Adi Granth, are a compilation of the laws and precepts of the Khalsa, a peculiar sect whose holy city was Amritsar, founded by Mānak. The Khalsa (lit., the Pure) aimed in their teaching partly for political, partly for religious reasons, at the brotherly amalgamation of Hindus and Moslems in the Punjab. For several centuries the Khalsa played a conspicuous rôle in that portion of India. This was more especially the case during the 17th century. Under British influence, however, the Khalsa gradually ceased to promulgate their doctrine. The Granths spoken of, show the Punjabi vernacular at its best. Consult Bhai Maya Singh, ‘Punjabi Dictionary’ (Lahore 1895); Bailey, Wm., ‘Punjabi Grammar’ (ib. 1904); Grierson, Sir G. E., ‘Linguistic Survey of India: Western Hindi and Punjabi’ (Vol. IX, part I, Calcutta 1908).

Wolf von Schierbrand,
*Author of ‘America, Asia and the Pacific.’*

**PUNJNUD,** or **PANJNAD** («the five rivers»), a stream of the Punjab, formed by the Sutlej, Beas, Ravi, Chenab and Jhelam, whose waters it carries to the Indus (q.v.), about 490 miles from the sea near Mithankot. The Punjnud bounds Punjab and Bahawalpur in part of its course.

**PUNKAH,** a large swinging fan used in India and other hot countries for ventilating rooms. It consists of a movable frame of wood covered with canvas or the like and suspended from the ceiling. It is pulled backward and forward by means of a cord, and thus causes a movement of the air in the apartment.

**PUNO,** poo'nō, Peru, (1) town, capital of the department of Puno, on the west shore of Lake Titicaca, 12,870 feet above sea-level, and 90 miles east by south of Arequipa. It has two churches, a college and a hospital. A railway runs to Arequipa and to Mollendo on the Pacific. Pop. 6,000. (2) The department of Puno; area, about 41,198 square miles, is mountainous. The principal crops are potatoes and barley, but it is particularly distinguished by the extent of its pastures, cattle raising being the chief occupation. Its principal exports are the wool of the sheep, llama, alpaca and vicuña, and some cascarilla bark from the valley of Carabaya. Pop. about 540,000.

**PUNSHON, William Morley,** English Wesleyan Methodist clergyman: b. Doncaster, Yorkshire, 29 May 1824; d. London, 14 April 1881. He studied at the Wesleyan College, Richmond, and in 1845 was received into the ranks of the ministry, his ordination occurring in 1849. He held charges in Newcastle-on-Tyne, Sheffield, Leeds, London and Bristol and became famous as a preacher. In 1868 he went to Canada where he worked assiduously to strengthen the position of the Methodist Church and he became widely known as a preacher and lecturer in both Canada and the United States. He was five times president of the Canadian Conference, and in 1873 he returned to England. He was elected president of the Conference in 1874 and in 1875 became one of the general secretaries of the Wesleyan Methodist Missionary Society. Author of ‹Sabbath Chimes,› verse (1867); ‹Sermons and Lectures› (3 vols., 1882–84). Consult Macdonald, F. W., ‹Life of William Morley Punshon› (1887).

**PUNT,** poont, an ancient country on the Red Sea, whether in Asia or Africa is disputed. The country is mentioned a number of times in the Egyptian hieroglyphics, and such records show that the Egyptians obtained from Punt ostrich feathers, leopard skins, gold, incense, ivory, precious woods and various ornaments. There are good reasons for locating Punt where is now Somali Coast and Abyssinia. Accounts are given of journeys to Punt, undertaken by command of monarchs. Queen Hatshepsut sent thither a whole fleet, and the account of the voyage, the persons and places seen in Punt were recorded on the walls of the temple of Deir el-Bahri. Consult Müller, ‹Asien und Europa›; Naville, ‹Deir el-Bahri›; Erman, ‹Life in Ancient Egypt.›

**PUNT,** an oblong flat-bottomed boat used for fishing and shooting in shallow waters. The most common mode of propulsion is by pushing with a pole against the bottom of the river, or stream, a process which is hence called punting. Also a similar boat used for racing on the Thames, England.

**PUNTA ARENAS,** poon'ta a-rä'näs (Sandy Point), Chile, port and capital city of the territory of Magellanes, at the extreme end of Patagonia (lat. 53° 10′ S.), and lying in a plain bounded by the rivers Las Minas on the north and La Mano on the south, with wooded hills back of the river. The city is a coaling station for steamers passing throught the Strait of Magellan, and as such has of late years risen to considerable importance. The surrounding country produces rye, barley, potatoes and other similiar crops and the timber exported to the Falkland Islands. The seal fisheries are considerable. The city has banks, stores, hotels and an opera-house. The site was made a penal colony in 1843 and the town was founded in 1849. Pop. about 20,000.

**PUNXSUTAWNEY,** Pa., city in Jefferson County, situated on Mahoning Creek and on the Pennsylvania and North Western, the Buffalo, Rochester and Pittsburgh and the Buffalo and Susquehanna railroads, about 90 miles northeast of Pittsburgh. It is the business centre of a great bituminous coal and coke region and the headquarters of the second largest producers of bituminous coal and coke in the United States. There are also large iron furnaces and numerous smaller industries. It is also the centre of a rich agricultural territory. Punxsutawney affords exceptional advantage for manufacturers of iron and steel products, as the pig iron is manufactured here and the coke to smelt it is also produced here, a combination that makes for the lowest possible cost of production. The cheap natural gas available here has attracted large glass manufacturing plants, which are very successful. The prosperity of the city is reflected in the rapid growth of the three large banks serving the business interests of the community. Punxsutawney is an Indian name. It was organized into a borough in 1850. Its growth since 1890, when it had a population of 2,792, has been rapid. Its Chamber of Commerce is well organized and there is an active Business Men's Association. Greater Punxsutawney has a population (1920) 10,311.

**PUPA,** the name applied to the second stage in the metamorphosis of insects. In the typical complete or holometabolic insects, exemplified by beetles, the *Lepidoptera,* flies, etc., the pupa stage is marked by quiescence and rest, and thus presents a contrast to the preceding and active larval stage. During the pupa stage the elements of the larval form are being remodeled into that of the *imago* or perfect insect, which in due time emerges from the pupa case. An insect may remain in the pupa stage from a few hours or days to weeks, months or even years.

The pupæ of the hemimetabolic insects, or those which undergo an incomplete metamorphosis (such as grasshoppers, locusts, bugs, etc.), are called nymphs and differ from the perfect insect, which they resemble in form, chiefly in the absence or rudimentary nature of the wings. These latter structures in the pupa state of hemimetabolic insects may generally be perceived to be in course of formation, the perfect insect or imago state being characterized simply by the full development of the wings. See CHRYSALIS; INSECTS; METAMORPHOSIS.

**PUPIN, Michael Idvorsky,** American scientist and inventor: b. Idvor, Hungary, 4 Oct. 1858. He came to America in 1874, was graduated at Columbia in 1883 and as the first American holder of the John Tyndall Fellowship of Columbia studied physics and mathematics at Cambridge University and under the famous von Helmholtz at the University of Berlin, there taking his degree of Ph.D. He returned to teach at Columbia, was appointed adjunct professor of mechanics there in 1892 and has been professor of electro-mechanics there since 1901. He is the inventor of long-distance telephony by means of self-inducting coils placed at intervals about the wire which preserving the vibrations and resonance transmits the sound a greater distance. Professor Pupin first announced the theory underlying his invention in March 1899, and brought his system to such perfection that in 1901 it was acquired by the Bell Telephone Company and by German telephone interests. He has perfected other valuable inventions in electrical-wave propagation, electrical resonance, in iron magnetization and in multiplex telegraphy. He was appointed director of the Phœnix Research Laboratories in 1911. In 1917 he presented to the United States government the use of his invention for eliminating static interference with wireless transmission. Appointed honorary consul-general in New York for Serbia, he was an active agent for that country during the World War, and organized for relief work a corps of Columbia students who served in Serbia in 1915. He has published ‘Thermodynamics of Reversible Cycles in Gases,’ etc.

**PUPPET-SHOWS,** an amusement or entertainment popular in Europe. One of the most common classes of puppets is called, in French, *marionnettes*. These are images of the human figure moved by wires or cords on a stage and made to perform little dramas, the dialogue of which is carried on by the person in concealment, who moves the figures. In the common street performance in England of Punch and Judy (q.v.), however, the performer puts his fingers in the figures. Puppet-shows were common among the Greeks, from whom the Romans received them. Xenophon, Aristotle, Gellius, Horace and others mention them. Such exhibitions, which are so pleasing to children and the uneducated, naturally passed through various degrees of perfection in different ages and even now exhibitions of puppets are common in some countries which display great mechanical ingenuity. Clocks often display movable puppets and it is not infrequent in Germany to find on ancient town-clocks puppets which move whenever the clock strikes. In 1674 there was a puppet opera at Paris, which met with great applause. They have been popular in many European cities, especially in Italy.

**PURACÉ,** poor-rä-sā', a volcano of the Andes in Colombia, 20 miles east of the town of Popyan. Eruptions have occurred several times; the town of Puracé at the base of the mountain was destroyed by the eruption of 1827; and the top of the volcano blown off and its height reduced to 15,420 feet by the eruption of 1849. It is still active and hot vapors issue constantly from the crater.

**PURANAS,** poo-ra'nạs. See SANSKRIT LANGUAGE AND LITERATURE.

**PURBECK** (pėr'bĕk) **BEDS,** a series of geologic beds or strata consisting of limestones, clays, shales and sandstones, which in England form the uppermost member of the Jurassic system (q.v.). They are named after the Isle of Purbeck on the southeast coast of Dorsetshire, where they are exceptionally well developed and yield among other building stones a limestone, susceptible of a good polish, which is known as Purbeck marble. The «Isle» is in fact a peninsula 12 miles long by 7 miles broad, almost completely surrounded by sea. The Purbeck beds appear in a chalky ridge which traverses the island from west to east.

**PURBECK, Isle of.** See PURBECK BEDS.

**PURCELL,** pėr'sĕl, **Henry,** English composer: b. London, 1658; d. 21 Nov. 1695. He was the son of a musician of the chapel-royal, who left him an orphan in his sixth year. He was admitted a chorister in the king's chapel, where he studied music under Choir-master Cook and his successor, Pelham Humphrey, and afterward under Dr. Blow. In 1676, when only 18, he was made organist of Westminster Abbey and six years afterward was appointed to fill the same office at the chapel-royal, Saint James. From this period his fame increased rapidly, his anthems and other church music being popular in all the cathedrals of the kingdom; nor were his compositions for the stage and music-room less successful. He composed music, religious and secular, with equal facility; and with respect to chamber music his compositions superseded all prior productions. Of his numerous works his ‘Te Deum’ and ‘Jubilate’ were composed for the celebration of Saint Cecilia's Day, 1694. Of his instrumental music a collection was published two years after his decease and comprised pieces in four parts, for two violins, tenor and bass. Many of his songs were published after his death under the title of Orpheus Britannicus. ‘Ye Twice Ten Hundred Deities,’ contained in this collection, is considered the finest piece of recitative in the language; while his music in ‘King Arthur’ has maintained its popularity undiminished to our own day. In 1695, the year of his death, he set to music ‘Bonduca,’ an opera altered by Dryden from Beaumont and Fletcher; but his chief opera is ‘Dido and Æneas’ (1680). He was the author of a vast variety of catches, rounds, glees, etc., remarkable both for their melody and for their spirit, humor and originality. He was buried in Westminster Abbey. A splendid edition of his works is published by the Purcell Society, founded in 1878. An earlier edition of his sacred compositions is that of Novello (1829–32). Consult Cummings, ‘Life of Henry Purcell’ (1882).

**PURCELL, John Baptist,** American Roman Catholic archbishop: b. Mallow, County Cork, Ireland, 26 Feb. 1800; d. Brown County, Ohio, 4 July 1883. He came to the United States in 1818, was educated at Mount Saint Mary's College, Emmitsburg, Md., received minor orders, and later studied at Saint Sulpician's College in Paris. He was ordained in 1826 and in 1827 appointed to the chair of philosophy in Saint Mary's College, of which he became president in 1828. In 1833 he was consecrated bishop of Cincinnati, and at once set about the improvement of the diocese under his charge, and in 1846 the number of churches under his control had increased from 12 to 70, the number of Roman Catholics from 6,000 to 70,000. He founded schools and academies, built a convent for the Ursulines, and in 1847 the diocese of Cleveland was formed out of that of Cincinnati at his request and placed in charge of another prelate. In 1850 he was made an archbishop and in 1851 received the pallium from the Pope's own hands. He founded Mount Saint Mary's of the West, destined to become one of the leading theological seminaries of the country, and in 1855 presided over his first provincial council. New sees were formed from his diocese in 1868, but though their creation had limited his diocese in extent, it still contained 140,000 Roman Catholics. He attended the Vatican Council in 1869 and celebrated his golden jubilee with great rejoicing among his people in 1876. In 1879, however, his hitherto unbroken prosperity was interrupted. His brother Edward had been appointed his vicar-general and the financial affairs of the diocese had been left by the bishop entirely in his brother's care, trusting implicitly in the latter's financial ability, which was unfortunately as little as the bishop's own. When the crash, rendered inevitable by faulty business methods, came, Edward died broken-hearted. The indebtedness reached nearly $4,000,000, and the crisis came at a time of general financial panic. The bishop, however, was never accused of any dishonesty, though the unwisdom of his confidence in his brother was widely criticised. His own light regard for the value of money was well known, as he had served as bishop for 25 years before he accepted even the «cathedraticum» of $5,000 a year, and when paid it usually was given away before night. He tendered his resignation in 1880, but it was not accepted though he was given a coadjutor. At his death the Roman Catholics in his original diocese numbered half a million. He published a series of textbooks for the use of Roman Catholic schools in his diocese.

**PURCELL,** Okla., city and county-seat of McClain County, on the Canadian River, 35 miles, direct, southeast of Oklahoma City, on the Atchison, Topeka and Santa Fé and the Gulf, Colorado and Santa Fé railroads. It is located in a cotton district which produces also alfalfa and grain. There are cottonseed-oil and flour mills, and grain elevators. Pop. 2,938.

**PURCHAS,** pėr'chąs, **Samuel,** English author and Anglican clergyman: b. Thaxted, Essex, about 1575; d. London, September 1626. He was graduated from Cambridge, took holy orders, was vicar of Eastwood, Essex, 1604–13, and in 1614 became rector of Saint Martin's, Ludgate, London, where he remained until his death. He published in 1613 'Purchas his Pilgrimage, or Relations of the World and the Religions Observed in All Ages and Places,' supplemented in 1625 by 'Purchas his Pilgrimmes' in four volumes. The first is his own work and the latter a collection of the narratives of different travelers, edited by him. The latter was illustrated with maps, and the edition of 1626 was supplemented by a fifth volume. It was a work of great value in its day, giving accounts of travels in Europe, Asia, Africa and America, and was soon imitated. It is valuable to-day as revealing the ideas prevailing in England at that time concerning the rest of the world at large. He also wrote 'Microcosmos, or the History of Man' (1619); 'The King's Tower and Triumphal Arch of London' (1623).

**PURCHAS JUDGMENT,** an English ecclesiastical decision rendered against Rev. John Purchas by the Privy Council of Appeals, 16 May 1871, in a case carried to it from the Canterbury Court of Arches, where an adverse decision was rendered 3 Feb. 1870. Purchas was charged with introducing and sanctioning Popish practices at Saint James' Chapel, Brighton, where he was perpetual curate; the objectionable practices, including the use of the cope, chasuble, alb, biretta, crucifixes, images, holy water, incense and the introduction of processions. The charges were brought against Purchas in the Canterbury Court of Arches by Colonel Elphinstone, and a decision against Purchas was given on eight points, the defendant to pay the costs of the action. Purchas made no appearance at the trial, affirming illness and lack of funds to pay for counsel. The promoter of the suit was not satisfied with this decision and appealed to the Queen in Council, but died before the case was tried. It was then taken up by Henry Herbert, of Brighton, and a decision against Purchas was rendered on practically all the points raised. Purchas had meantime placed all his property in his wife's hands, so that the costs could not be collected from him; and he was said to continue the illegal practices. He was suspended from the discharge of his clerical office 7 Feb. 1872, but he disregarded the order and continued his services as usual until his death at Brighton, 18 Oct. 1872.

**PURCHASE SYSTEM,** a system of appointment and promotion for officers, prevailing in the English army from the time of Queen Anne until 1871, when it was abolished by royal warrant. About half of the officers of the army received their appointments under it. It was possible to purchase an ensigncy or cornetcy for £450, a price fixed by government regulation, and subsequent promotion could be purchased, as vacancies occurred, up to the rank of lieutenant-colonel. The prices fixed by regulations were as follows:

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| Lieutenant-colonel | £4,500 |
| Major | 3,200 |
| Captain | 1,800 |
| Lieutenant | 700 |
| Cornet or Ensign | 450 |

Vacancies in certain popular regiments, particularly the Guards, commanded fancy prices, but no position could be purchased unless the officer holding it chose to sell. No rank above lieutenant-colonel could be purchased. Death vacancies, vacancies occurring through augmenting a regiment and those resulting from the promotion of colonels to be major-generals were filled without purchase either by seniority or special merit. The purchase system did not exist in the artillery, engineers, marines, 19th to 21st regiments of cavalry and 101st to 109th regiments of foot.

In the United States army and navy discharge by purchase may be secured in peace times by enlisted men in the second year or first six months of the third year of enlistment upon presentation and verification of satisfactory reasons. The price of purchase in the first month of the second year is $120, and is $5 less each succeeding month during the period in which discharge may be secured by purchase. The favor will not be granted a second time.

**PURDUE UNIVERSITY,** the Indiana State College of Agriculture and Mechanic Arts, is located at Lafayette, Ind. It was established under the land grant act of Congress in 1862 and in 1869 was named for John Purdue, who gave $150,000 and 100 acres of land to the State for the institution. It was first opened to students in 1874. Its present organization includes seven schools: (1) the School of Mechanical Engineering; (2) the School of Civil Engineering; (3) the School of Electrical Engineering; (4) the School of Chemical Engineering; (5) School of Agriculture; (6) the School of Science; (7) the School of Pharmacy. All of these offer regular courses extending over four years and leading to the bachelor's degree. The School of Pharmacy also offers a two years' course and the School of Agriculture a special short winter course. The degree of bachelor of science is conferred in all departments. Graduate work is provided for leading to the degrees of master of science, master of science in agriculture, mechanical engineer, civil engineer, electrical engineer and chemical engineer. Under the Federal law establishing the institution, instruction in military science and tactics is required of all male students during the first two years. The institution is coeducational, women enrolling in the schools of science, pharmacy and agriculture. The institution owns about 1,000 acres of land, of which 600 are adjacent to its buildings and used for campus and experimental farm purposes. There are 24 principal buildings, including a library, erected in 1913, and the university auditorium, a gift of Eliza Fowler. An important feature of the institution is its series of laboratories, all well equipped with modern scientific appliances. The engineering plant is particularly complete, including a locomotive testing plant, the first of its kind to be installed. The library contains about 60,000 volumes and pamphlets, mostly of scientific and technical character. Tuition is free for residents of the State. The income of the university is derived from the land grant fund of 1862, from subsequent Federal appropriations, from the State mileage tax, from student fees, etc. The total income of the institution for all purposes for the year ending 30 June 1923 was $1,608,765. Its property, buildings and equipment has an estimated value of $2,400,000. The number of students enrolled for the year ending June 1923 was 3,000, of which over 1,900 were in college classes in courses leading to degrees. Co-ordinated with the departments of instruction are the Agricultural Experiment Station and the Department of Agricultural Extension, maintained by Federal and State appropriations, the former concerned with agricultural research and the latter with the diffusion of knowledge on agricultural subjects to the people of the State. The university ranks high among schools of technology and holds an influential place in the educational system of the State.

**PURE FOOD ACTS.** Pure food legislation has been rendered necessary by the willingness of producers to flood the markets with food products, drinks and drugs which are adulterated. These adulterations were induced by the desire of manufacturers to increase their profits. The practice resulted in wholesale frauds upon the public which unwittingly bought inferior articles labeled as goods of standard quality. It also involved a serious menace to public health, inasmuch as food products and drugs, particularly meat, were commonly sold which were impure, diseased or otherwise wholly unfit for human consumption. The grossness of the abuses which developed resulted in the enactment of laws both by the national government and the States.

**Federal Pure Food and Drug Acts.**— In legislating upon this subject Congress was confronted by certain constitutional obstacles. Under our Federal system of government Congress has only such powers as are conferred upon it by the express words of the Constitution or which may be reasonably implied from the powers thus expressly granted. The Constitution gives Congress no authority to legislate upon the subject of food and drugs nor to regulate the processes of manufacturing. Obviously, therefore, it was impossible to pass a Federal law dealing in a direct and straightforward manner with the evils of adulteration and misbranding. Congress does, however, have full power to regulate interstate commerce and this authority was used as the constitutional basis of the national Pure Food and Drug Act. This act, signed by President Roosevelt 30 June 1906, does not forbid the production of adulterated and misbranded food products and drugs, except in the Territories and the District of Columbia where the authority of Congress is supreme, but merely forbids the distribution in interstate trade of such products as are fraudulent or unhealthful according to standards provided for in the law.

The principal provisions of the law are as follows: (1) It is unlawful to ship or receive in interstate or foreign commerce any adulterated or misbranded food or drugs. (2) The Secretary of the Treasury, the Secretary of Agriculture and the Secretary of Commerce and Labor shall make regulations for putting the act into effect, including the collection and examination of specimens of food and drugs. (3) Examinations of such specimens shall be made in the Bureau of Chemistry of the Department of Agriculture to determine violations of the act. (4) Drugs are to be regarded as adulterated if they are sold under a name recognized by the United States Pharmacopœia and differ from the standards of strength, purity or quality therein laid down, except in cases in which the standards of strength, quality and purity are plainly marked. Drugs are also adulterated if their strength or purity is less than the professed standard under which they are sold. (5) Food is adulterated, first, if anything has been mixed or packed with it which reduces its quality or strength; second, if any substance has been substituted for it in whole or in part; third, if any valuable ingredient has been wholly or partially removed; fourth, if it has been mixed, colored, powdered, coated or stained so as to conceal damage or inferiority; fifth, if it contains any added poisonous or injurious ingredient which may render it harmful to health; sixth, if it consists in whole or in part of filthy, decomposed or putrid animal or vegetable substance or any part of an animal unfit for food, or if it is the product of a diseased animal, or one that has died otherwise than by slaughter. (6) Drugs are regarded as *misbranded* if the packages or labels contain false or misleading statements regarding the contents or place of production, if they are imitations of or offered for sale under the name of another article, if the original contents of the packages have been changed since they were labelel, if the label does not indicate the quantity or proportion of alcohol, morphine, cocaine and other narcotics, and finally, by an amendment passed in 1912, if the label contains false statements regarding the curative or therapeutic effects of the contents. (7) Similar provisions cover the misbranding of food which must also, under an act of 1913, be marked with the measure, weight or numerical count save in the case of very small packages, and must not be labeled or branded in such a way as to deceive or mislead the purchaser.

**The Meat Inspection Act.**— This act was also passed 30 June 1906 and aims to provide special protection against the distribution in interstate commerce of unwholesome meat or meat products. Animals must be inspected by government officials before they are killed, the carcasses must be again inspected afterward, meats which are packed or canned must be further inspected and marked, and the establishments in which meat is killed, packed or in any way prepared must also pass close scrutiny. The government pays the cost of these inspections. To prevent corruption on the part of the inspectors they are frequently shifted from one part of the country to another on short notice. The administration of the law is in the hands of the Secretary of Agriculture who utilizes for that purpose the Bureau of Animal Industry. The beneficial results of these laws have been enormous. A large number of dishonest and injurious products have been driven from the markets forever to the great advantage of the pocketbook and health of the consumer. Manufacturers and producers have come to realize the commercial advantages of purity and cleanliness and have in numerous cases been glad to advertise the fact that they have gone far beyond the requirements of the law in those particulars. The commercial incentive to fraud and adulteration has thus been largely removed.

**State Laws.**— Since the pure food and drug laws of the national government are limited in their scope to the products which are distributed through interstate commerce it is only natural that the separate states should have legislation upon the same subject. Several facts should be noted about these State enactments. First, they apply to production, sale or distribution of food and drugs within the State. Second, they are in many cases more comprehensive in scope and more rigorous in the standards set up than the Federal laws. Third, they must be so drawn as not to produce a conflict with the Federal laws in their application or administration. For example, a State, under the guise of passing a law for the protection of the health of its citizens, may not forbid the importation and sale within its borders of food or drugs in their original packages which meet the tests of the Federal law in the matter of purity or labeling. Few conflicts of this kind, however, occurred and the legislation of the Federal government and the States upon this important subject have merely supplemented each other.

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**PURGATIVES,** cathartics; medicines for evacuating the bowels. See Cathartic; Constipation.

**PURGATORY,** according to the doctrine of the Roman Catholic Church, a state or place in which the souls of those who depart this life in the grace of God suffer for a time, in expiation of their venial transgressions or in undergoing the penalty due to mortal sins, the guilt and eternal punishment of which have been remitted. Hence purgatory is not a place or state of probation: for the souls in purgatory the time of probation is past, and they are already assured of their everlasting bliss in heaven, though as yet they are not sufficiently pure and holy to be admitted to the vision of God. The dogmatic teaching of the Church goes only so far as to declare that, (1) there is a purgatorium (place of purification), and (2) that the souls therein are aided by the prayers of their brethren on earth. But though the definitive teaching of the Church stops here, the speculations of divines, the meditations of spiritual men and the beliefs of the general mass of the faithful go much further, and have developed an idea of purgatory which is very much more definite. Thomas Aquinas and Suarez, among the greatest lights of the theological schools, teach that instantly after passing out of the present life, the faithful souls are cleansed from the stains of all venial sin by their turning with perfect love to God; at the same time the debt of the temporal penalties of sin, whether mortal or venial, has still to be paid. Theologians formerly taught that the purgation was by material fire, but this view has been widely modified. While confessedly the doctrine of purgatory is not clearly and unequivocally deducible from any passage of the universally accepted books either of the Hebrew or the Christian Scriptures (for Maccabees is not received by all as canonical, and passages of the New Testament which Catholics believe to point decisively to this doctrine have no such signification for Protestants), it is admitted on all sides that in the very earliest church liturgies that are extant are found forms of prayer for the dead, and that the existence of an intermediate state after death is taught by the fathers both Eastern and Western with practical unanimity, so far at least as to admit that the dead can be aided by the prayers of the living. Buddhists, Theosophists and many others teach of a region where discarnate souls are purified before they can go higher.

**PURIFICATION,** in the Jewish ceremonial law, a body cleansing with water accompanied by rites more or less elaborate according to the nature of the uncleanness from which the person was to be purified: this physical cleansing being regarded as emblematical of an inward spiritual purification. For different occasions of purification and different rites, see Leviticus xi, 25–40; xv, 1–15; xv, 18; Numbers xix. Similar rites of purification are common to pagan religions whether of ancient or modern times. In the ritual of the Roman Catholic Church, the rinsing of the chalice after communion and the ablution of the fingers of the celebrant after the same are called a purification.

**PURIFICATION OF THE BLESSED VIRGIN MARY, Feast of the,** a festival observed in the Roman Catholic Church on 2 February; in the calendar of the Episcopal Church in the United States, as well as in that of the Established Church of England, the Purification of the Virgin Mary is entered for the same day, and in the Book of Common Prayer there are collect and lessons for the day of «the Presentation of Christ in the Temple, commonly called the Purification of Saint Mary the Virgin.» The events commemorated by the Church on this day are those recorded in the gospel of Saint Luke, ii, 22–39, namely, the going of the Virgin to the temple 40 days after the birth of her son, for her ritual purification after childbirth, according to the prescriptions of Leviticus xii; the presentation of the babe to the Lord; and the prophecies of Simeon and Anna. The Chfistian festival of the Purification was solemnized by the Church at least as early as the end of the 6th century. It is customary on this day, in Catholic countries, for the people and clergy to form processions, each one carrying a lighted candle, signifying the light which the Redeemer brought into the world.

**PURIFYING APPARATUS,** is of use in many industries and economic processes, particularly in the water supply of communities where the available source does not yield a pure product. Aside from the various chemical treatments of such waters the electrolytic system has found favor in that it purifies without adding some other ingredient. It has been found that certain metals are capable of producing, while under the action of an electric current immersed in the liquid to be purified, an insoluble hydroxide of the chlorides and sulphates held in solution, these being set free by the action of current passing through the liquid (see Electrolysis); the oxygen evolved at the anode decomposing and oxidizing impurities of animal and vegetable origin, leaving the water clear, free from odor and disease-breeding germs, sparkling, with a pure water taste (see Distillation). For municipal supply, means are provided for the generation of electricity by either hydraulic or artificial power, using large basins containing the electrodes in which the oxidation takes place; the water passing thence into a coagulating section provided with means to retard the suspended matters; the water flowing thence down an inclined weir for the purpose of aeration, into another compartment of the basin containing screens, which clarifies it from all sediment, thence to storage reservoirs, occupying small space as compared to sand bed filters and automatic in operation. The apparatus for potable and industrial use consists of vessels capable of working under high pressure as for boiler feed purposes, one of which contains the electrodes or a series of them for very large supply; the electrodes being connected to a suitable source of electric supply, the vessels being provided with air-valves and insulators to prevent the grounding of the current, and connected to other vessels by suitable conduits to remove the suspended matters, thus permitting a constant flow of the water through the apparatus, requiring small space and installed at any convenient point. For apartment-houses and hotels, and establishments for bottling carbonated waters small installations are quite efficient. They are arranged so that the motor may be run by the hydraulic pressure in the water main if desired. The current consumption is very low as the resistance of the water is utilized in the treatment.

In the gas industry the «purifier» consists of a number of sieve-like trays placed in tiers. These are filled with the purifying material and the gas is compelled to pass through them consecutively. In the first purifier the trays are filled with lime thiocarbonate and some sulphurets which remove the poisonous carbon dioxide, although increasing the content of sulphureted hydrogen. The second purifier contains slaked lime, and removes nearly all the carbon disulphide and part of the sulphureted hydrogen. The third purifier may be a duplication of the second, or, if the gas is not too foul, it may go at once to the last purifier, filled with iron oxide, which removes the last traces of the sulphides and sulphurets.

In the flour-milling industry the purifying apparatus is pneumatic. After the grain has been through the fourth pair of breaking rolls and is in the form known as semolina, ready to be ground into flour, it is passed through the purifier, a long silk-covered sieve of varying meshes, enclosed in an air-tight compartment. The sieve dips downward on a slight grade and is shaken by appropriate machinery. At the top of the purifier is an exhausting fan which sucks a draught of air up through the sieve and the «semolina» which is traveling down the grade upon the silk. The chaff and light fibrous material which has no food value is carried off into side channels by the draught, while the heavier food parts of the grain continue down the sieve until they come to a mesh which they can pass through, being thus sorted as to size for further treatment. The material removed by the draught amounts to from 10 to 15 per cent of the grain. This is again passed through a purifier of somewhat different weave, and a part of it is recovered and added to the semolina to be ground. The purifying chamber is provided with glass windows through which the process may be watched, and the arrangement of fan and air valves is such that the force of the draught may be adjusted with the greatest delicacy.

**PURIM**, poo′rĭm, the Festival of Lots, which was instituted by Mordecai (Esther ix, 27–x, 3), and is celebrated to this day by the Jews on the 14th and 15th of the month Adar (March), in commemoration of their wonderful deliverance from the destruction with which they were threatened by Haman. On these festive days the book of Esther is read, presents are interchanged, and gifts are sent to the poor. The great popularity of this festival in the days of Christ may be gathered from the following remark of Josephus: «Even now all the Jews that are in the habitable earth keep these days as festivals and send portions to one another.» It is supposed that it was this feast which Jesus went up to celebrate at Jerusalem (John v, 1). It is universally celebrated by the large Hebrew population in the United States. See Befana.

**PURITAN CITY**, a name applied to Boston, Mass., referring both to the early settlers and the characteristics of its modern inhabitants.

**PURITANISM.** The Puritans were those who thought that the English Reformation had not gone far enough in its separation from the Roman Catholic Church, but that there were many ceremonies and forms still retained in the worship which were too suggestive of papacy. They held that it was not expedient or right to retain the use of the cross in baptism, the clerical vestments, the custom of kneeling at the altar and other forms which had been rejected by the Reformed Churches on the Continent. They believed that the worship should in this way be purified and that only those who lived upright lives should be the ministers of the Church. To them the Church was a means of advancing religious truth, and it could not do this to the best advantage while hampered, as they thought, by useless, misleading and unscriptural forms and ceremonies, especially when these forms and ceremonies were obligatory for all and the observance of them enforced by the civil authority. During the persecution of the Protestants in the reign of Mary, hundreds of the English reformers went to the Continent and were in the company of the leaders of the Reformed Church. When Elizabeth came to the throne, these men returned and became the leaders of English Protestantism. Some of them regarded the wearing of the vestments prescribed by the Church authorities as a matter of indifference, others refused to wear them. They did not object to the government of the Church of England or the close connection between Church and State or the doctrinal system, but objected to what they regarded as the remnants of popery.

Whether they would be allowed to do as they wished or not depended largely on the attitude of the queen. Elizabeth was a woman whose religious tastes were stronger than her religious convictions and the simplicity and bareness of the worship of the Reformed Church offended her. She disliked Puritanism because the teachings of men like John Knox opposed her idea of the royal power. She opposed any puritanical modification of the Prayer Book or of the ceremonies of the Church. That there was to be no room for nonconformity was shown when her first Parliament passed the Act of Uniformity, which made unlawful any form of public worship but that of the Prayer Book, and the Act of Supremacy, by which the queen was acknowledged supreme governor of the realm in spiritual and ecclesiastical affairs. She resolved to retain in the worship as much show and form as possible, and ordered uniformity in vestments. If any refused they were forbidden to preach and deprived of their office. This law was not strictly enforced at first, but with greater rigor as the time went on. Large numbers were ejected from their churches, but continued to hold private meetings. Many were imprisoned and treated with severity. But nonconformity continued to grow notwithstanding the efforts to suppress it.

In early Puritanism the objection is mainly to the forms and ceremonies in the worship of the Church. In the later years of the reign of Elizabeth, attention is given to the government of the Church and the relation between Church and State. Elizabeth claimed that in this her will was supreme. Some of the Puritans, above all others, Thomas Cartwright, taught that the only right form of Church government was that laid down in the New Testament and that it was Presbyterianism. He taught that the civil authorities are not to interfere in Church affairs, but they are bound to protect it. There is still to be a state church but with a Presbyterian rather than an Episcopal form of government. This was directly opposed to the queen's supremacy, and her efforts to suppress this form of Puritanism were vigorous. These Puritan movements were within the Established Church, but there were some who believed that a church having any connection with the state was unscriptural and so there arose the party called Independents or Separatists. They taught that the local church was independent and should manage its own affairs. These were also called Brownists from Robert Browne, who was their first leader. The Separatists were severely persecuted and many left the country. Thus, at the close of the reign of Elizabeth, there are three kinds of Puritans: those who desire a purified worship and still remain in the Church, those who would have a state church under the Presbyterian form of government and those who believed that an established church was wrong. Hopes were entertained that James VI, educated in Presbyterian Scotland, would be more favorable to Puritanism. The clergy petitioned him for freedom from the burden of human rites and ceremonies and the matter was considered at the Hampton Court Conference. But James' motto was «no bishop, no king,» so they could look for little toleration. Uniformity was enforced with great vigor and many Puritans deprived of all hopes of redress left the country. This condition continued with even greater severity in the reign of his son, Charles I, and there seemed in the early part of his reign no check on his tyranny in Church and State. Despairing of freedom in Old England, Puritan and Separatist turned to America to create there a New England. In 1620 a little company of Separatists after a sojourn in Holland came to America and settled at Plymouth. In the course of the next 20 years thousands of Puritans settled in Massachusetts. This Puritan emigration stopped in 1640, when there seemed a better prospect of liberty in England. The Puritan emigrants came as members of the Church of England with no desire to separate. The Pilgrims were already separated from the English communion and were independent in their church government. But the Puritans because of their distance from the home country and because of the influence of the Pilgrims very quickly adopted the Congregational or Independent form of church government. Modern American descendants of the Puritan settlers regard them as having been far too strict. Their so-called «blue» laws are spoken of as indicating religious bigotry and intolerance.

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**PURITANS.** See PURITANISM.

**PURKINJE'S FIGURES,** *in optics,* figures produced on a wall of uniform color when a person entering a dark room with a candle moves it up and down approximately on a level with the eyes. From the eye near the candle an image of the retinal vessels will appear projected on the wall.

**PURPLE.** A color located in the spectrum between crimson and violet. It is poetically termed the royal color. The ancients attributed the discovery of purple to the Phœnicians. The story of its having been discovered by a dog biting a purple-fish, and thus staining his mouth, is well-known. The purple-fish was found not only on the Phœnician coasts, but in all other parts of the Mediterranean, so that the use of it in dyeing came to be common with other nations. The modern discovery of purple colors from coal-tar makes an important epoch in the history of the dye. Painters in oil and water-colors produce various shades of purple by mixing certain red and blue pigments. For work in oil, French ultramarine, often called French blue, is mixed with vermilion or some madder red (madder carmine is best), or one of these reds with cobalt blue if a pale purple is wanted. For permanent purples in water-colors the same blues are used; but one of the madder reds, not vermilion, should be mixed with them. A much richer purple than any of the above mixtures will give is produced by Prussian blue and one of the lakes from cochineal — namely, carmine or crimson lake — but it is not permanent. This purple, as well as that obtained by mixing Indian red with indigo, also fugitive, was much used by water-color painters in past years. Purple madder is the only simple purple pigment available for the artist which is durable, and it is unfortunately costly. All purples are changed to neutral and gray tints by the addition of any yellow pigment. For house-painting maroon lake with a little French blue gives a useful purple. See DYES; PURPLE SHELL.

**PURPLE-FACED MONKEY.** See LANGUR; WANDEROO.

**PURPLE FALCON, Order of the.** See ORDERS, ROYAL.

**PURPLE FINCH,** a handsome American finch (*Carpodacus purpureus*) which in some one of its varieties is known throughout the United States and Canada. The male exhibits in spring a plumage beautifully tinged with a purplish crimson; and sings a brilliant melody. These birds nest in orchard trees and similar places, and lay greenish speckled eggs. See FINCH.

**PURPLE MARTIN,** one of the large, lustrous, blue-black swallows of the genus *Progne,* several species of which inhabit South and Central America, while one (*P. subis*) is a familiar visitor in summer to almost all parts of the United States. They originally nested in hollow trees, but in both North and South America have at once associated themselves with mankind as soon as civilization approached their habitat, and now everywhere make their nests about buildings or in garden bird-boxes. They are among the most useful as well as interesting of our insect-hunting birds. See MARTIN.

**PURPLE SCALE.** See SCALE INSECTS.

**PURPLE SHELL,** a gastropod mollusk of the family *Muricidæ* and especially of one section of it of which the genus *Purpura* is typical. A great many species are found in all seas. The true purples form the subfamily, *Purpurinæ.* The *Muricidæ* are carniverous marine snails very destructive to other mollusks, barnacles, etc. Many of the tropical species of *Murex* and related genera are of large size and remarkable for the large spines borne upon the shells, but our representatives of the family are small and inconspicuous. (See DRILL). Our true purple shell (*Purpura lapillus*) is found in great abundance on rocky coasts on both sides of the north Atlantic, but is infrequent in the United States south of Long Island Sound, where it is replaced to some extent by related species. The shell is very thick and solid, short oval with a low spire and a large aperture, the outer lip of which is marked with revolving ridges. It is extremely variable in size, shape, color and markings. Like the drill it is carnivorous, but with us confines its attacks chiefly to the barnacles which encrust the rocks between tides, though in Europe it works great havoc on the mussel beds.

The name «purple shell» applied to this group of mollusks is derived from the use to which certain species were put by the ancients in the preparation of their most valued dye-stuffs, for which the city of Tyre was especially famous, and upon which its prosperity about 1000 B.C. was founded. The Tyrian purples were of several shades, varying from blue to a dull crimson, dependent upon the particular variety of shell employed and the substances mixed with the extract. Among the most important species utilized were *Murex trunculus, M. brandaris* and *Purpurea patula.* These snails were gathered on both the African and European shores of the Mediterranean. The smaller ones were crushed in mortar-shaped holes in the rocks and mixed with soda, urine, sea-water and other substances; the larger animals were removed from their shells or the dye squeezed out. The desired colors were obtained by exposure to the sun and by various combinations and the cloth was steeped in a large excess of fluid until the proper effect had been produced. The fluid is contained in a saccular gland which opens into the mantle cavity and has at first the color and consistency of cream and a disagreeable odor, but changes to purple upon exposure to light. Consult Simmonds, ‹Commercial Products of the Sea.›

**PURPURA.** See PURPLE-SHELL.

**PURSER,** the cashier or chief clerk on board a passenger steamer. In the navy a purser was formerly an officer who took charge of the provisions of a ship of war and saw to their distribution among the officers and crew. He had very little to do with money matters, but generally bore an evil reputation among the sailors for unfair dealing and rapacity. The designation is now discarded for that of paymaster, whose duties are broader.

**PURSLANE,** a pot-herb and well-known weed forming a good fodder for pigs; often called «pussley.» See PURTULACA.

**PURSUIVANT,** pėr′swĭ-vạnt, a title used in the heraldry of England, Scotland and Ireland and derived from the old Latin word «proseque,» to follow. It is the lowest of heraldic offices, but from the pursuivants were usually selected the superior officials known as herald and king-at-arms. The English college of arms has four pursuivants, the Scottish heraldic establishment has three and the Ulster king-at-arms in Ireland has four.

**PURU-PURUS,** poo-roo′-poo-roos′, or **PURU PULAS,** a tribe of Brazilian Indians, now extinct or represented only by the Pamary or Paumary, but formerly living along the Purus River (q.v.) in western Brazil. They were naked savages, who slept on the sand instead of in hammocks, and were afflicted by a leprous disease which covered them with bluish and whitish spots. They used practically no shelter or covering, except leaf umbrellas, and wore their hair long and unkempt, cut only on the forehead in a square bang. Linguistically they seem to have been separate from the surrounding peoples. Consult Brinton, ‹The American Race› (1891).

**PURUANDIRO,** poo-roo-än-dē-rō, Mexico, a town of the state of Michoacán and capital city of the district of Puruandiro in central Mexico, situated on the southern shore of a small lake, about 42 miles northwest of Morelia. It does a large business in Mexican leather and in the agricultural produce of the surrounding country. Pop. 10,000.

**PURURAVAS,** in Vedic mythology a king of ancient India, son of Ilā, a youth of many virtues, who is married to Urvaśī, one of the celestial nymphs, Apsarases, usually loved by the Gandharvas. Urvaśī's marriage to Pururavas is based on the condition that she shall never see him naked. The jealous Gandharvas cause a disturbance in the night and Pururavas springs up, whereupon the Gandharvas cause a flash of lightning to illuminate the room and Urvaśī sees him and vanishes. Pururavas, disconsolate, seeks the world over for her and at last discovers her in the form of an aquatic bird, swimming with other Apsarases in a lotus lake. In response to his pleadings Urvaśī promises that he may return to her for one night a year later. Purusavas keeps the tryst and on the following day the Gandharvas make him one of themselves. Another version is that Urvaśī spends four autumns among mortals and is besought by her lover, Pururavas, to return, but refuses; promising, however, that his offspring shall worship the gods and that he himself shall enjoy heaven. Consult Macdonell, A. A., ‹Vedic Mythology› (Strassburg 1897).

**PURUS,** poo-roos′, an affluent of the Amazon, which rising in the east of Peru traversing the northwest corner of Bolivia and entering Brazil, a northeastward course of over 1,800 miles, joins the Amazon about 100 miles above the latter's confluence with the Madeira. It has a very winding course and a comparatively slight fall. In the flood season it is navigable almost throughout its length and steamers ascend it for over 800 miles. Chief among its numerous tributaries is the Acre. Its source was discovered in 1864 by Chandless, an English explorer. Throughout most of its course the shores of the Purus are covered with dense forests in which are to be found but few inhabitants. Those who are living there are, for the most part, native Indians.

**PURVER,** pėr′vėr, **Anthony,** English translator: b. Hurstbourne, Hampshire, 1702; d. Andover, Hampshire, July 1777. He was at first apprenticed to a shoemaker, but mastered Hebrew, and at 20 opened a school. Later he went to London where he became a Quaker and there began his translation of the Bible in 1733, a task which occupied him for 20 years. It was completed in 1763 and published under the title ‹A New and Literal Translation of all the Books of the Old and New Testament› (1764). The publication was known as the ‹Quaker's Bible› and by many was pronounced crude and unscholarly, while warmly approved by Southey and other critics. He also published ‹Youth's Delight› (1727); ‹Poem to the Praise of God› (1748), and ‹Counsel to the Friend's Children› (1785).

**PURVES,** pėr′vĕs, **George Tybout,** American clergyman: b. Philadelphia, Pa., 27 Sept. 1852; d. New York, 24 Sept. 1901. He was graduated from the University of Pennsylvania in 1872 and from the Princeton Theological Seminary in 1876. He was pastor at Wayne, Pa., 1877–80, and professor of New Testament literature and exegesis at Princeton Theological Seminary 1892–1900. In the last-named year he accepted a call to the Fifth Avenue Presbyterian Church, New York. He wrote ‹The Testimony of Justin Martyr to Early Christianity›; ‹The Apostolic Age,› etc.

**PURVEY,** pėr′vĭ, **John,** English Biblical translator: b. Lathbury, Buckinghamshire, about 1354; d. about 1427. While associated with Wyclif, whose disciple he became, he undertook with other scholars the revision of the translation of the Bible made by Wyclif in 1380. The revision was substantially a new work merely based on Wyclif's copy which had retained many Latinisms from the Vulgate. The new translation, on the other hand, was made in good idiomatic English. It was completed about 1388, four years after Wyclif's death. For his Wyclifite views he was imprisoned in 1390, recanted to escape martyrdom in 1401, and for two years was vicar of West Hythe, Kent. Purvey wrote against the corruption of the Church a work entitled 'Ecclesiæ Regimen.' Consult Leachler, 'John Wyclif and his English Precursors,' translated by Lorimer (1884).

**PUS.** See SUPPURATION.

**PUSEY,** pū'zĭ, **Caleb,** American Quaker colonist: b. Berkshire, England, about 1650; d. Chester County, Pa., 25 Feb. 1727. He was educated a Baptist, but joined the Quakers and came with Penn's company to America in 1682, erected the first mills in the province known as the «Chester Mills,» and of which Penn himself laid the cornerstone. He laid out roads, treated with the Indians, was sheriff of Chester County for two years, justice of the peace and of the County Courts for many years, an associate justice of the Supreme Court and for 10 years a member of assembly. He published a great number of pamphlets and articles in defense of his creed, among them 'A Serious and Seasonable Warning' (1675); 'A Modest Account from Pennsylvania of the Principal Differences in Point of Doctrine between George Keith and those of the People called Quakers' (1696); 'Saturn's Harbingers Encountered' (1700), etc.

**PUSEY, Edward Bouverie,** English scholar and theologian: b. near Oxford, 22 Aug. 1800; d. Ascot Priory, Berkshire, 16 Sept. 1882. He was a son of the Hon. Philip Bouverie (of the Radnor family), who assumed the name of Pusey by royal license on becoming lord of the manor of that name in Berkshire. He was educated at Eton and Oxford University, where he was graduated with first class honors. Soon after he was elected to a fellowship at Oriel College. He studied for two years in Germany, taking up more especially Oriental languages, theology and German, and in 1828 was appointed regius professor of Hebrew, a post which he retained all his life, and to which a canonry at Christ Church is attached. In 1826 he had published a book summarizing the progress of German theological thought since the Reformation, expounding the rationalistic views regarding religion which were common in Germany, his account of which was founded on his own personal experience of what he believed to be the evils of Rationalism. He became through the influence of his friends Hurrel, Froude and Newman an ally of the theological party who started the Tracts for the Times (see TRACTARIANISM), but the agitation had been going on a little time before he took an active part in it. His first tract was the 18th, 'On the Benefit of Fasting'; he subsequently wrote another (the 66th) on the same subject, and two (the 67th and 69th) 'On Holy Baptism.' In connection with the same High Church movement he undertook the joint-editorship of the 'Library of the Fathers' and the 'Library of Anglo-Catholic Theology.' In 1843 he was suspended from preaching in the university pulpit for three years on account of a sermon on the Eucharist, in which he advocated the doctrines of the real presence, sacerdotal absolution and of the duty and privilege of confession. Except for literary labors and occasional sermons, Dr. Pusey's life was henceforward an uneventful one. Among his chief works are a treatise on 'The Ancient Doctrine of the Real Presence'; 'Letters to the Archbishop of Canterbury in Defence of Church Principles'; a treatise on 'Marriage with a Deceased Wife's Sister'; a 'History of the Councils of the Church' (1857); a learned 'Commentary on the Minor Prophets' (1860–77), an important contribution to Hebrew scholarship. Nine lectures on 'Daniel the Prophet' (1864), and 'The Church of England, or Portion of Christ's Holy Catholic Church: an Eirenicon' (1865). As a leader of the Tractarian or High Church party he kept a large section of that party from drifting into the Catholic Church and remained unshaken in his fidelity to the church of his baptism. On this ground, perhaps, the party received the popular name of Puseyites. Pusey House, containing his library, was founded and endowed as a memorial to continue the tradition of his teaching. Consult Liddon, 'Life of Edward Bouverie Pusey' (5 vols., 1893–99); Grafton, 'Pusey and the Church Revival' (1902); Rigg, J., 'Character and Life-Work of Dr. Pusey' (1883); Savile, B. W., 'Dr. Pusey, an Historic Sketch, with Some Account of the Oxford Movement' (1883).

**PUSEYISM.** See OXFORD MOVEMENT, THE.

**PUSHKIN,** poosh'kin, **Alexander** (spelled also POUSHKIN, POUCHAKIN), Russian poet: b. Moscow, 26 May (7 June) 1799; d. Saint Petersburg, 29 Jan. (10 Feb.) 1837. He received his first education in the Lyceum at Tsarskoë-Selo. In 1817 he entered the service of the government in the Ministry of Foreign Affairs, in 1820 was retired to southern Russia because of his liberal opinions, until 1824 was a subordinate in the office of the governor-general of Odessa, angered his superior by an epigram and was withdrawn wholly from the service and ordered to live on his estate of Mikhailovskoë. In 1826 Nicholas I allowed his return to Saint Petersburg, where he was made imperial historiographer. His only work of research, however, was the 'History of the Revolt of Pugachev'; he labored in the archives on an account of Peter the Great, which came to nothing. He died from a wound received in a duel, and the Tsar appropriated 150,000 rubles to settle his affairs and publish his works. These included, above all, 'Eugeni Onyegin' (1828), a metrical narrative in a somewhat Byronesque fashion; and 'Boris Godunov,' a tragedy dealing with the troublous period following the death of Tsar Feodor. Pushkin performed a great service for the Russian language and literature; molding the former, which prior to his time was uncouth and unwieldy, and freeing the latter from its French tradition and placing it solidly upon a native basis. He has been called «undeniably and essentially the great national poet of Russia.» There are English renderings of 'Eugeni Onyegin' (by Spalding, 1881); of the 'Poems' (by Panin, 2d ed., 1888); and of the 'Prose Tales' (by Keane, 1896). A memorial work, 'Translations from Pushkin,' by Turner, appeared in 1899. Consult Shaw, 'Sketch of Pushkin's Life and Works' (1845); Flach, 'Un Grand Poète Russe' (1894). See BORIS GODUNOV; EUGENI ONYEGIN.

**PUSS IN BOOTS,** a well-known nursery tale by Charles Perrault, whose version, 'Le chat botté' appeared in his 'Contes de Fées' (1697). It was probably taken from Straparola's 'Piacevoli Notti.' The story is found in a Norse version in ‹Lord Peter,› and in the Swedish ‹Palace with Pillars of Gold,› in which the cat befriends a girl, whose adventures are similar to those of the Marquis of Carabas. In a Sicilian version is found the first hint of a moral which is lacking in the above-mentioned tales; that is, the ingratitude of the man. Cosguin imagined from the moral that its origin was Buddhistic, for the story could only have arisen in a comparatively civilized community; but the only Hindu version, the ‹Match-Making Jackal,› discovered about 1884 in Bengal, has no moral at all. The most complete moral is found in Zanzibar, in the Swahili tale of ‹Sultan Darai,› in which the beneficent beast is a gazelle; the ingratitude of the man is punished by the loss of all that he had gained; the gazelle, which dies of neglect, is honored by a public funeral. A well-known German version is that by Tieck, ‹Der gestiefelt Kater,› 1795).

**PUSTULES.** See Pimples.

**PUT YOURSELF IN HIS PLACE,** a novel by Charles Reade, published in 1870. The scene is laid in an English manufacturing town, and the story narrates the struggles of Henry Little, workman and inventor, against the jealousy and prejudice of the trades unions. Like all of Reade's stories, ‹Put Yourself in His Place› has a wealth of dramatic incident, and moves with dash and vigor. It is notable for its underlying purpose of exposing without censure the errors of early trades unions.

**PUTCHOCK,** pu-chok', or **PUCHUCK,** the root of *Aplotaxis lappa,* the «costus» of the ancients, a composite plant growing on the Himalayas in the vicinity of Cashmere. It has long lyrate leaves and heads of purple florets. It is exported to the Malay countries and to China, where it forms a main ingredient in the Chinese pastille rods known as joss-sticks. In Upper India it is given as a medicine in various complaints ranging from coughs to cholera.

**PUTLITZ,** poot'lits, **Gustav Heinrich Gans,** Edler Herr von und zu, German novelist and poet: b. Retzin, Prussia, 20 March 1821; d. there, 9 Sept. 1890. He was educated at Magdeburg, Berlin and Heidelberg, was engaged in the civil service in 1846–48 and made his début in literary circles by his comedies which aptly portrayed high social life and excelled in humor. In 1863 he was appointed director of the court theatre at Schwerin. and his collected dramas were published in 1850–69. His poems were characterized by much beauty and grace and his charming fairy poem ‹Was sich der Wald erzählt› (1850) was widely circulated. His novels were also popular. Among his publications are ‹Vergissmeinnicht› (1851); ‹Brandenburgher Geschichten› (1862); ‹Novellen› (1863); ‹Funken unter der Asche› (1871).

**PUTNAM, Emily James Smith,** American author and educator, daughter of Justice James C. Smith: b. Canandaigua, 15 April 1865. She was graduated at Bryn Mawr College in 1889 and studied at Girton College, Cambridge University, in 1889–90. She was teacher of Greek at the Packer Collegiate Institute, Brooklyn, in 1891–93; Fellow in Greek at the University of Chicago in 1893–94, and dean of Bernard College in 1894–1900. She was married to George Haven Putman (q.v.) in 1899. She was a trustee of Barnard College in 1900–05, and vice-president and manager of the Women's University Club, New York, in 1907–11. In 1901–04 she was president of the League for Political Education. Author of ‹Selections from Lucian› (1891); ‹The Lady› (1910); ‹Greek Religion› (1913).

**PUTNAM,** pŭt'nạm, **Frederick Ward,** American archæologist and ethnologist: b. Salem, Mass., 16 April 1839; d. 1915. He became curator at Essex Institute in Salem in 1856, was graduated from Harvard in 1862 and in 1864 became director of the Essex Institute Museum. In 1867 he was appointed superintendent of the East Indian Marine Society's Museum at Salem and in 1875 was appointed civilian assistant on the United States surveys west of the 100th meridian, his duties being to make investigations and reports of the archæological and ethnological material collected. In 1876–78 he was in charge of the Agassiz collection of fishes at the Museum of Comparative Zoology and in 1886 was appointed professor of American archæology and ethnology at Harvard. He was chief of the department of ethnology at the World's Columbian Exposition in 1893. He is author of numerous pamphlets on scientific subjects, was one of the founders and editors of the *American Naturalist,* and has edited many volumes of ‹Annual Reports of the Trustees of the Peabody Museum of Archæology and Ethnology› and ‹Proceedings of the Essex Institute.›

**PUTNAM, George Haven,** American publisher and author, son of G. P. Putnam (q.v.): b. London, England, 2 April 1844. He was educated in New York, Paris and Göttingen, leaving the university at the latter place to enter the Union army as a volunteer in 1862. He served through the war, was a prisoner at Libby in the winter of 1864–65, and attained rank as major of volunteers. He is head of the firm G. P. Putnam's Sons, was a leader in reorganizing the American Copyright League in 1887 and was instrumental in securing the passage of the copyright bill in 1891. He has published ‹Authors and Publishers› (1883); ‹The Artificial Mother› (1894); ‹Books and their Makers in the Middle Ages› (1896); ‹The Censorship of the Church› (1906); ‹Abraham Lincoln› (1909); ‹Memories of a Publisher› (1915).

**PUTNAM, George Palmer,** American publisher and author: b. Brunswick, Me., 7 Feb. 1814; d. New York, 20 Dec. 1872. He entered the book store of Jonathan Leavitt in New York in 1828, became a member of the firm Wiley and Putnam in 1840 and in 1841 went to London where he conducted a branch business. In 1848 he returned to New York, opened a publishing house, engaged in the production of finely illustrated books and established *Putnam's Magazine* 1853–56, which was resumed in 1868 and afterward merged with *Scribner's Monthly.* In 1866 he established the publishing firm now known as G. P. Putnam's Sons. He was an ardent advocate of international copyright reform, secretary for many years of the Publishers' Association, a founder of the Metropolitan Museum of Art, and wrote ‹A Plea for International Copyright› (1837); ‹Chronology› (1833); ‹The Tourists in Europe› (1838);

‹American Facts› (1845); ‹The World's Progress› (1850); ‹Ten Years of the World's Progress› (1861), etc.

**PUTNAM, Herbert,** American librarian: b. New York, 20 Sept. 1861. He was graduated at Harvard (1883); studied law at Columbia (1883–84), and was admitted to the bar (1886). He received also the degrees of Litt.D. from Bowdoin (1898), LL.D. from Columbian (now George Washington University, 1903), University of Illinois (1903), University of Wisconsin (1904), Yale (1907), Williams (1911), Litt.D. from Brown (1914). From 1884–87 he was librarian at the Minneapolis Athenæum, and at the Minneapolis Public Library (1887–91). After this he practised law at Boston (1892–95), and became librarian at the Boston Public Library (1895–99). Since March 1899 he has been librarian of Congress. He was twice president of American Library Association (1898, 1904). Numerous articles have been published by him in reviews and professional journals.

**PUTNAM, Israel,** American Revolutionary soldier: b. Salem (now Danvers), Mass., 7 Jan. 1718; d. Pomfret (now Brooklyn), Conn., 19 May 1790. His education was a desultory one. In 1740 he removed from Salem and purchased in that part of Pomfret, Conn., which is now Brooklyn, the farm where he afterward resided. It is said that he also hung out a shingle advertising entertainment for man and beast. There is also the well-known anecdote of the exploit in which he crept into the lair of a destructive wolf and there dispatched the animal. But little definite is known of Putnam's life until he is found in 1755 in receipt of a commission as captain of Connecticut volunteers in a regiment sent by the colony to aid in repelling a threatened French invasion of New York. He was present at the defeat of the French and Indians under Dieskau near the southern end of Lake George, and later was very successfully employed as a ranger and scout. In 1756 he commanded a company in Abercrombie's army, which had Crown Point as an objective, but was so outplayed by Montcalm as to be obliged to act rather defensively than offensively. He received a major's commission from the Connecticut legislature in 1757. During Abercrombie's expedition against Ticonderoga in 1758 Putnam commanded an advance guard and scouting party of 100. In the retreat following the rash and disastrous attack on the post he became aide to Abercrombie, replacing Howe, who had been shot. Having been sent out in August to capture from the enemy a large quantity of British stores, he was taken prisoner and tortured by the Indians, but rescued by a French officer. He was sent to Ticonderoga and thence to Montreal, where he was exchanged. Promoted lieutenant-colonel in 1759, he accompanied the force sent against Montreal, upon whose surrender Canada passed into English hands. In 1762 he commanded the contingent of 1,000 sent by Connecticut in the naval expedition against Havana. His vessel was wrecked off the Cuban coast, but those on board escaped by rafts, and took part in the successful attack on Havana. He was sent out against the Indians of the frontier, who, under Pontiac (q.v.), were menacing Detroit, in 1763. A peace was concluded; Putnam returned to his farm, and there remained in retirement until 1775. When the news of Lexington reached him, he is said to have been plowing, Cincinnatus-like; and at once to have turned loose the oxen and ridden to Cambridge. A Connecticut regiment was forthwith organized, and Putnam, with a brigadier's commission, appointed to command it. In May he led a battalion to Noddle's Island, where he captured a sloop and burned a schooner of the enemy. He was a participant in the battle of Breed's (Bunker) Hill, which he had helped to fortify; the chief command in the action has been claimed for him against Prescott. Trumbull, in his picture in the Capitol at Washington, shows Putnam in brilliant uniform defending a gun. Commissioned major-general in July, he was placed in command at New York, and was ranking officer within the fortifications during the battle of Long Island. After having been stationed at Philadelphia, Crosswick and Princeton, he was sent in May 1777 to command in the «Highlands» of New York. Owing to the loss of Fort Montgomery and Fort Clinton, he was removed from his command; but later was restored on being acquitted by a court of inquiry. Subsequently, when he was commanding in Connecticut, Horseneck, an American outpost, was attacked by the British under Tryon. Putnam, according to the story, escaped by dashing on horseback down-hill, and eventually pursued the retreating Tryon, from whom he took 50 prisoners. In the winter of 1779 he was stricken with paralysis and incapacitated from further service. Consult ‹Lives,› by Tarbox (1876), and Livingston (1901); Ober, ‹Old Put, the Patriot› (1904).

**PUTNAM, John Pickering,** American architect: b. Boston, Mass., 1847; d. 23 Feb. 1917. He was graduated from Harvard in 1868, studied later in the École des Beaux Arts, Paris, and in the Royal Academy of Architecture, Berlin. He afterward practised his profession in Boston and published ‹The Open Fire Place in All Ages›; ‹The Principles of House Drainage›; ‹Improved Plumbing Appliances›; ‹The Outlook for the Artisan and His Art.›

**PUTNAM, Mary Traill Spence Lowell,** American author, sister of James Russell Lowell (q.v.): b. Boston, Mass., 3 Dec. 1810; d. there, 1 June 1898. She was married to Samuel R. Putnam in 1832 and later traveled abroad for several years. Her literary work was confined to magazine writing until 1844, when she translated from the Swedish Fredrika Bremer's ‹The Handmaid.› She afterward published ‹History of the Constitution of Hungary› (1850); ‹Records of an Obscure Man› (1861); ‹The Tragedy of Errors› and ‹The Tragedy of Success,› a dramatic poem in two parts (1862); ‹Fifteen Days› (1866); ‹Memoir of Charles Lowell› (1885), etc.

**PUTNAM, Rufus,** American Revolutionary soldier: b. Sutton, Mass., 9 April 1738; d. Marietta, Ohio, 1 May 1824. He was apprenticed in 1754 to a millwright, but acquired some knowledge of surveying and later found employment in that profession. In March 1757 he enlisted as a private for service in the French and Indian War, and re-enlisted yearly until 1761, being made ensign in 1760. His story of the campaigns in which he served may be read in the ‹Journal› which he kept throughout. He was a farmer successively at New Braintree, Mass. (1761), Brookfield, Mass. (1765) and Rutland, Mass. (1780). In 1773 he went to Florida as one of an investigating committee appointed to examine lands granted by the Crown to Colonial soldiers and officers who had fought in provincial regiments during the French and Indian War. Putnam was made deputy-surveyor of Florida by the governor of the province and accompanied the expedition up the Mississippi to the Yazoo, up the Yazoo to Haines' Bluff, back to the Big Black and thence in return down the Mississippi. He planned and directed the construction of the Continental lines of defense at Roxbury and for the excellence of his work was detailed by Washington as acting chief engineer of the army. On 11 Aug. 1776 he was appointed by Congress chief engineer of the army, with colonel's rank; but preferring service in the field, he resigned in December and took command of the 5th Massachusetts Regiment. With the northern army in 1777 he did conspicuous service, particularly at Stillwater, where he headed the 4th and 5th regiments of Nixon's brigade. On 7 Jan. 1783 he was promoted brigadier-general. He was for several years a member of the Massachusetts legislature and during Shays' rebellion (q.v.) (1786–87) was a very efficient aide on the staff of Gen. Benjamin Lincoln. In March 1787 he was chosen (with Gen. S. H. Parsons and Rev. Manasseh Cutler) a director of the Ohio company, organized (1 March 1786) with a capital of $1,000,000 in public securities, to be expended in the purchase of land in the Northwest Territory. In July a contract was made with Congress for one and a half million of acres and soon afterward an ordinance, familiarly known as the «Ordinance of 1787,» was passed, providing for the government of the Territory. On 7 April 1788 Putnam, meanwhile made superintendent of the company, landed with a party of emigrants at the mouth of the Muskingum and on the present site of Marietta commenced the first organized settlement in the Northwest Territory. He concluded in 1792 at Vincennes a treaty with eight tribes of the Wabash Indians and in 1793 resigned his commission in the army. He was one of the judges of the United States court in the Territory, 1790–96, and from 1796 until his removal by Jefferson for political reasons in 1803 was surveyor-general of the United States. He was the founder of the first Bible society west of the Alleghanies (1812), a sturdy Federalist in politics and with the exception of Lafayette the last survivor of the general officers of the Continental army. Consult his ‹Journal,› edited, with sketch by Dawes (1886). Putnam's papers, including the manuscript ‹Journal› and correspondence with Fisher Ames, Trumbull, Washington and others are preserved at Marietta in the library of the college there; they were edited by Rowena Buell (1904) under the title ‹The Memoirs of Rufus Putnam and Certain Official Papers and Correspondence.›

**PUTNAM, William Le Baron,** American jurist: b. Bath, Me., 12 May 1835; d. 5 Feb. 1918. He was graduated from Bowdoin College in 1855, admitted to the bar in 1858 and practised in Portland, Me., 1858–92. In 1887 he accepted an appointment by President Cleveland as commissioner to settle with Great Britain the rights of American fishermen in Canadian waters and was also a member of the commission under the treaty of 6 Feb. 1896 between Great Britain and the United States. He had twice declined appointments as justice of the Maine Supreme Judicial Court, but in 1892 accepted an appointment as judge of the United States Circuit Court. In 1888 he was the Democratic candidate for governor of his State.

**PUTNAM,** Conn., city, one of the county-seats of Windham County, on the Quinebaug River, junction joint of New York, New Haven and Hartford main line and Norwich and Worcester branch, about 45 miles east by north of Hartford. It was incorporated from portions of the towns of Thompson, Killingly and Pomfret, by the State assembly in May 1855 and was organized as a municipality 3 July 1855 and in 1895 was chartered as a city. Near the centre of the city are Cargill Falls, noted for their beauty. It is the centre of an agricultural region and has a number of manufacturing interests. The chief industrial establishments are cotton and woolen mills, a tire fabric factory, silk mills, manufactories of heaters and castings and a toolmaking plant. The number of employees in the manufactories is about 2,200. It has the Day Kimball Hospital, Mother House of the Sisters of the Holy Ghost and seven churches and a Jewish synagogue. The educational institutions are a high school, State trade school, public and parish schools and a public library. There are two banks, one National, with a capital of $150,000 and one savings and the business annually is over $20,000. The government is administered under the charter of 1895, which provides for a mayor, who holds office two years, and a council of nine members. A board of three commissioners operates the municipally-owned water supply system. Pop. (1920) 7,711.

**PUTNAM, Fort,** a former Revolutionary fort at West Point, N. Y.

**PUTS AND CALLS.** See STOCK EXCHANGE.

**PUTTENHAM,** pŭt'ĕn-am, **George,** English author: b. about 1530; d. about 1600. He is reputed to be the writer of a work entitled ‹The Arte of English Poesie, contrived into three bookes; the first of Poets and Poesie, the second of Proportion, the third of Ornament,› which appeared anonymously in 1589. The Arte is a review of ancient as well as modern poetry and was written for the court. It shows considerable literary knowledge and no small critical power. Its author wrote several other pieces which have been lost. The authorship of ‹The Arte› also has been claimed for Richard Puttenham, his brother.

**PUTTIALA,** pŭt-tē-ä'lä. See PATIALA.

**PUTTKAMER,** poot'kä-mĕr, **Robert Viktor von,** Prussian statesman: b. Frankfort-on-the-Oder, 1828; d. Karzin, Prussia, 15 March 1900. He was educated at Heidelberg, Geneva and Berlin, entered government service in 1854 and as a friend and relative of Bismarck his rise was rapid. He was elected to the Reichstag in 1873 as a Conservative member and in 1877 was chief president of the province of

Silesia. In 1879 he became minister of education and public worship and endeavored to carry out the compact Bismarck had made with the Clericals. In 1881 he was appointed minister of the interior and vice-president of the ministry. He energetically enforced measures against the Socialist party and his methods in favoring the election of government candidates aroused the opposition of the Radicals and were bitterly attacked in a speech by Eugene Richter. After the accession of Friedrich III, Puttkamer resigned and though it was expected that he would be reinstated when Wilhelm II came to the throne, he was merely appointed chief president of Pomerania in 1891.

**PUTTUN.** See Pattan.

**PUTTY,** a mixture compounded of whiting and linseed-oil, sometimes with a slight addition of white lead, beaten together to the consistence of a thick dough. It is used by glaziers for the purpose of fixing sheets of glass in the frames of windows, etc., and also by painters for filling up holes in the surface they are about to paint. It becomes very hard when dried. Plasterers make a so-called putty of ground white lime softened with water. Putty powder is tin dioxide, useful for polishing glass, etc.

**PUTUMAYO,** poo-too-mä'yō, or **IÇA,** a South American river, rising in the southwestern part of Colombia on the eastern slope of the Cordillera. It flows southeast for about 1,000 miles, almost on the line of the equator in its midcourse, receives at the right the San Miguel and Yahuas and at San Antonio after about 150 miles in Brazil empties into the Amazon. It was explored by Reyes and Crevaux, is navigable within 100 miles of its source and promises to be a valuable commercial waterway between Brazil and Colombia. The name is also applied to the territory through which it flows, which was exploited early in the 20th century by an English syndicate. Sir Roger Casement headed an official investigation, which disclosed the utmost barbarity in collection of rubber from the natives. The company was driven out of existence. Consult Hardenburg, ‹The Putumayo› (1912) and ‹The Putumayo Red Book› (1914).

**PUVIS DE CHAVANNES, Pierre,** pē-ār pü-vēs dė shä-vän, French painter: b. Lyons, 14 Dec. 1824; d. Paris, 25 Oct. 1898. He sprung from an old Burgundian family of strong Catholic traditions. His father was an engineer and he himself was destined to the same career, but an intervening illness and a journey to Italy confirmed a predilection for painting. His first master was Ary Scheffer, with whom he studied but a short time and went for a second visit to Italy. Returning he put himself under the tuition first of Delacroix, then of Couture, but parted from each of them after a short period, as he had with his former master, from an inability to submit to any leading but his own artistic instincts. Certain marks of the influence of these men are seen by critics, particularly of Delacroix, even in the very latest products of Puvis' life. These may be traced in the more fundamental traits of his drawing, in the composition, spacing and the like. Others incline to the belief that his work rather suggests the influence of his early visits to Italy, in a sort of reminiscence of the frescoes of Piero della Francesca. Such suggestions seem for the most part only an effort toward discovering subtle resemblances urged on by the really insistent originality of this artist's work. Working out his own theories which were at variance with all the ruling traditions of his day it is not wonderful that he should have encountered opposition. The Salon refused his work nine times. In 1861 came his first recognition when he gained a second-class medal and sold his pictures ‹War› and ‹Peace› to the state. These were placed in the Museum of Amiens to which the painter later presented the companion pieces ‹Rest› and ‹Labor.›

In 1872, as member of the Salon jury, he disagreed with his colleagues and resigned. He was made president of the Society of French Artists, holding their exhibition in the Champs de Mars and in 1877 was made officer of the Legion of Honor.

As a wall-painter he was the great leader of modern times in recognizing the limitations imposed by this branch of painting and in submitting himself to its demands. He saw that fresco was only the agreeable decoration of a wall surface, which should not attempt to conceal its character as a wall by sharp contrasts of light and shadow and elaborate arrangements of foreshortening and perspective. Consequently he painted in flat tones of cool green, blue, brown or lilac, having always in mind the relation of his designs to their architectural surroundings. His pictures themselves were essentially architectural in their arrangements. Among his mural decorations are those at Marseilles, Lyons, Lille and Poitiers, those in the hotels de Ville at Rouen and Paris, the Hemicycle of the Sorbonne in Paris, the series on Saint Genevieve in the Pantheon and the decorations of the staircase of the public library in Boston. In the last-named work he sought, as he himself stated, «to represent under a symbolic form and in a single view the intellectual treasures collected in this beautiful building.» The whole seems to be summed up in the composition entitled ‹The Muses of Inspiration hail the Spirit, the Harbinger of Light.› Apollo occupies the centre of this panel and the white-robed Muses, draped in filmy white, are ranged in mid-air against a background of pale green grass, with flowering bushes and slender trees, with the deep blue ocean and pale luminous sky stretching beyond. «Out of this composition,» writes Puvis de Chavannes, «others have developed which answer to the four great expressions of the human mind, Poetry, Philosophy, History, Science.» On the right-hand wall of the staircase as one enters appear in three panels: (1) Pastoral Poetry (Virgil); (2) Dramatic Poetry (Æschylus and the Oceanides); (3) Epic Poetry (Homer crowned by the Iliad and Odyssey). Consult Michel, ‹Puvis de Chavannes› (1912).

**PUY, Le,** lė pü-ē, France, arrondissement and capital city of the department Haute Loire. (1) The arrondissement, a little to the southeast of the centre of the department, has an area of 8,680 square miles and a population of about 145,716 and is divided into 14 cantons and 115 communes. Its capital and that of the department is (2) Le Puy, or Le Puy-en-Velay, lying at the confluence of the Dolezon and the Born, on the sides and top of the Mont Anis (whence its mediæval Latin name of Anicium or Podium Anicense), so that its least elevation is about 2,500 feet above sea-level and its greatest, the volcanic dike called the Rocher de Corneille about 2,500. It is ill-built but picturesque. The Rocher de Corneille is topped by a statue of Notre Dame de France made from Russian cannon taken at Sebastopol. The city is a bishop's seat and has a cathedral at the top of a staircase with 136 steps; other important buildings are an old chapel of the Templars, known as Diana's temple, the Gothic church of Saint Michel d'Aiguille (962–984), the splendid marble and bronze Crozatier Fountain, and the Crozatier Museum, which is especially rich in exhibits of the industries of the town. These are chiefly laces, especially guipure, tulle, woolens, bells and clocks. Pop. 21,420.

**PUY-DE-DOME,** pü-ē-dė-dōm, France, a central department of the Auvergne, bounded on the north by Allier, on the east by Loire, on the south by Haute-Loire and Santal, and on the west by Corrèze and and Creuse, and so named from the peak 4,086 feet in the Puy-de-Dôme group of volcanic mountains in the northern part of the department. The southern range, called Mont-Dore is higher, and the geology and mountain structure of the region is interesting. The highlands are excellent pastures; rye and oats grow at more moderate elevations; and vineyards, wheat, hemp and flax-fields cover the lowlands. The forest timber is valuable, as are the mineral waters and the coal deposits. Capital, Clermont-Ferrand (q.v.). Area 3,070 square miles. Pop. 525,916.

**PUYALLUP,** poo-yăl'ŭp, an American tribe, similar to the Nisqually family in Washington and Oregon. They formerly occupied all the region about the Puyallup River. A remnant of about 300 of them reside on a reservation near Tacoma.

**PUYALLUP,** Wash., city in Pierce County, five miles southwest of Tacoma, on the Puyallup River and on the Northern Pacific Railroad. The State Masonic Home is situated here and there is also a home for soldiers' widows. The surrounding district is largely devoted to raising raspberries and there is a canning factory and also lumber interests. Pop. (1920) 6,271.

**PUZZOLANA.** See CEMENT.

**PYÆMIA** (formerly suppurative fever, purulent infection, purulent diathesis, etc.), no longer means pus in the blood, but is a form of blood-poisoning (q.v.) of microbic origin, septic infection due to the absorption of pyogenic germs. The typical pathological condition is the production of multiple abscesses in tissues remote from the seat of injury, produced by living bacteria (forms of cocci probably) transported by the blood. Various experiments have shown that pus taken up by the blood-current does not produce pyæmia unless it contains virulent microbes. Sometimes the abscesses of pyæmia are metastatic or embolic caused by the lodgment of infected emboli in arterioles or veinlets, the inflammation of these vessels and its extension to surrounding areas. Formerly when antisepsis was unknown it was quite common. At the present time pyæmia is infrequent, except where injuries are much neglected. Yet it may begin in the veins of the face and the sinuses of the cranium, from acute and chronic otitis media, etc. It may be associated with or precede septicæmia (a poisoning due to living bacteria in the blood), and death may result from the general infection of the system. Fortunately absorbed virulent microbes are sometimes killed or neutralized by leucocytes, by the chemical bodies called by Buchner sozins and alexins, by the tissue-cells of the liver, spleen, etc., or may be excreted in a living state by the glandular excretory organs. The onset of pyæmia is marked by depression of the vital powers, chills, fever, sweating, and sometimes jaundice; by a coated dry tongue, a rapid feeble pulse, a foul breath; by constipation, followed by foul-smelling loose movements and by scanty high-colored urine. When these symptoms follow a surgical operation or an injury, and abscesses are not so superficial as to be discovered, deep-seated ones are surmised.

The treatment is preventive and curative. See that the patient's power of resistance is not lowered. Keep the bowels and kidneys active. Intestinal putrefaction must not occur. Sunlight, good air and nourishing food are necessities. As yet no reliable serum-injection has been found to grant immunity. Wounds should be treated antiseptically, and abscesses be antiseptically opened, cleaned and drained. Stimulants, quinine and other tonics are indicated.

**PYAT,** pe-a, **Felix,** French journalist and politician: b. Vierzon, France, 4 Oct. 1810; d. Saint Gratien, France, 5 Aug. 1889. He studied law and was admitted to the bar in 1831, but confined his attention chiefly to literature and politics. He was an advocate of the attempted insurrection in 1849, a signer of Ledru-Rollin's appeal to the populace, and was forced to escape from France after the failure of the plan. He busied himself in forming further schemes for revolution, living successively in Switzerland, Belgium and England, and was a member of the «European revolutionary committee.» When the general amnesty was granted in 1870 he returned to France, speedily attained leadership among the Paris Communists and was prominent in the destruction of the Vendome column. The fall of the Commune rendered flight again imperative and for his part in the Communal government he was tried and placed under sentence of death in 1873, though then absent from France. He was pardoned in 1880, returned to France and in 1888 was elected deputy from Marseilles.

**PYCNOGONIDA.** See PANTOPODA.

**PYDNA,** pĭd'na̤, in ancient history, a city of Pieria in Macedonia, originally on the west coast of the Thermaic Gulf, but removed three miles inland by Archelaus. The Athenians controlled it for a time, but lost it to Philip the Great. In 168 B.C. at the battle of Pydna, Perseus of Macedon was utterly defeated by the Romans under Æmilius Paullus — the death-blow of the Macedonian empire. In Byzantine times the city of Kitron or Kitros grew up on the same site and this name is borne by the present town.

**PYE,** pī, **Henry James,** English poet-laureate: b. London, 10 July 1745; d. Pinner, Hertfordshire, 13 Aug. 1813. He was educated at Oxford, and in 1784 entered Parliament from the county of Bucks, but played an unimportant part there. He was crowned laureate in 1790 and dutifully fulfilled the expectations of his office in producing his two odes a year. Other verse came from his pen, but nothing that rises above the dead level of commonplaceness. He was made one of the magistrates of Westminster in 1792. Pye was a voluminous writer, contributed to the literature of the stage and translated Aristotle's ‹Poetics.› He seems, however, not to have set great store on his poetry himself, and observed that he had rather be thought a good Englishman than the best poet or the greatest scholar that ever wrote.

**PYGMALION**, pĭg-mā'lĭ-ŏn, (1) in Greek legend a son of Clix and grandson of Agenor, king of Cyprus. In the story told by Ovid (Met. x, 243) he conceived an aversion to women and devoted himself to art, but having made an ivory statue he became so enamored of it that he entreated Aphrodite to endow it with life. This was done: the statue became a beautiful woman whom Pygmalion married and by whom he had Paphos, founder of the city of that name in Cyprus. W. S. Gilbert's play, ‹Pygmalion and Galatea,› is founded on this story. (2) Tyrian king and brother of Dido. He murdered Dido's husband Acerbas or Sichæus upon which Dido took her dead husband's treasures and sailed for the coast of Africa where she founded Carthage.

**PYGMIES**, the name given by the ancients to a race of dwarfish men reported as existing in various parts of the world. Homer (Il. iii, 6) fixes the habitat of the pygmies in the far southland whither the cranes migrate at the approach of winter; after Homer the battles of the cranes and the pygmies are a favorite theme of poets, and are often pictured on vases. Ancient authors, whether travelers, historians, or miscellanists, like Herodotus, Ctesias or Pliny, describe the pygmæi as little men, the tallest of them not exceeding in height two *pygmæ* (Gr. *pygme*, a measure of length, the distance from the elbow to the knuckles — less than 14 inches). Herodotus locates his pygmæi in the heart of Africa in a region traversed by a great stream — probably the Niger — flowing from west to east and modern geographical research gives support to his story after it had long passed for fabulous. In recent times the actual existence of pygmies has been ascertained beyond any question, though when Paul B. Du Chaillu (q.v.) in 1861 published his ‹Explorations and Adventures in Equatorial Africa› his description of the pygmy tribes discovered by him was scouted by scientific men as mere fiction. But when his report was confirmed in every essential particular by the missionary Father des-Avanchers (1869), by Schweinfurth (1871), by Stanley (1876) and others, scientific skepticism gave way, grudgingly, to conviction of Du Chaillu's good faith. Many different tribes of pygmies are now recognized as existing in the interior of Africa, all possessing these characteristics: stature ranging from 33 inches to 4 feet 4 inches, as reported of the Wambutti by Stanley: Schlichter makes the average stature 4 feet 6 inches; complexion, from yellowish brown to reddish brown; usually heavy growth of hair on body and face — a curious item of accordance with the report of Ctesias regarding the pygmæi of India, who had «beards and hair so long as to serve for vesture»; retreating forehead; prognathic jaw; fingers long, tapering, and feet strongly arched; in their villages the huts (8 feet long, 5 feet wide, 4 feet high) are clustered round the hut of the chief; their usual food is vegetable, but they eat almost anything; in hunting they show great intelligence; one tribe, the Wambutti, devise exceedingly ingenious nets, nooses and traps for securing game great and small.

Three types of pygmies are now recognized: (1) The African pygmies above described; (2) the Island pigymies of the Philippines, Andaman and the Tapiros, probably of African origin, but mixed breed; (3) the Asiatic pygmies, distinguished by wavy hair, found in the southern portion of the Malay Peninsula, in Celebes, and some Indian jungles. They are taller than the African pygmies and their heads are differently shaped, being dolichocephalic. Consult Wollaston, ‹Pygmies and Papuans› (1912).

**PYLADES**, pī'lạ-dēz, a legendary Greek hero, celebrated for the friendship which existed between him and Orestes. He assisted Orestes in murdering his mother Clytæmnestra, and eventually married Electra, the sister of his friend. See ORESTES.

**PYLE**, pīl, **Howard**, American artist and author: b. Wilmington, Del., 5 March 1853; d. 1911. He combined literary and artistic talent, and in this double capacity began his career in New York City by contributing to various periodicals. Having achieved a reputation he returned to his native place where he resided after 1879. He was instructor at the Drexel Institute, Philadelphia, but his time was largely occupied with original productions for current periodicals. In art he especially affected scenes of colonial life and of mediæval folklore and was remarkably successful in conveying their spirit. Some of the finest achievements in color printing in the magazines of recent times have been from his drawings. Works of which he was both author and illustrator are ‹The Merry Adventures of Robin Hood› (1883); ‹Pepper and Salt, or Seasoning for Young Folks› (1885); ‹Within the Capes› (1885); ‹The Wonder Clock› (1887); ‹The Rose of Paradise› (1887); ‹Otto of the Silver Hand› (1888); ‹A Modern Aladdin› (1891); ‹Jack Ballister's Fortunes› (1894); ‹Twilight Land› (1895); ‹Semper Idem› (1903). He also wrote ‹Rejected of Men› (1903), the story of the Christ in modern setting; ‹The Story of Launcelot and his Companions› (1907); ‹The Ruby of Kishmoor› (1908); ‹The Story of the Grail› (1910).

**PYLOS**. See NAVARINO.

**PYM**, pĭm, **John**, English statesman: b. Brymore, Somersetshire, 1584; d. London, 8 Dec. 1643. He was educated at Oxford, and in 1602 entered the Middle Temple, but was never called to the bar. He became member of Parliament for Calne in 1614, but from 1625 sat for Tavistock. He was prominent in the impeachment of the duke of Buckingham in 1616, and in 1639, with several others, held close correspondence with the commissioners sent to London by the Scottish Covenanters. When Parliament met again in 1640, Pym was one of its most active and leading members, and in the Long Parliament, which met later that same year, he came most prominently to the front. Possessed of great eloquence, he made a vigorous and effective speech as soon as Parliament had opened, dwelling at length upon the grievances of the nation with respect to parliamentary privileges and civil and religious liberty. A few days after he followed up his speech by bringing a charge of high treason against the Earl of Strafford, prime minister of Charles I; and in the impeachment which followed, resulting in the death of Strafford, he took the leading part. In 1641 a motion was carried by the opposition party to submit a remonstrance to the king, exposing the defects of his administration since ascending the throne, and the zeal of Pym in this matter led Charles into the imprudent measure of going to the Parliament in person to seize him and four other members. Clarendon relates that Charles I, feeling the necessity of gaining at any cost an enemy at once so implacable and so skilful, offered to Pym the post of chancellor of the exchequer. In November 1643, he was appointed lieutenant of the ordnance, but died the following December. He was buried with great pomp in Westminster Abbey. Consult Forster, ‹Statesmen of the Commonwealth› (1841–44); ‹The Arrest of the Five Members› (1860); and ‹The Debates on the Grand Remonstrance› (1860); Smith, Goldwin, ‹Three English Statesmen› (1867); Gardiner, S. R., ‹The Great Civil War› (1893); Wade, ‹John Pym› (1912).

**PYNCHON,** pĭn'chŏn, **John,** American colonist: b. Springfield, Essex, England, 1621; d. Springfield, Mass., 17 Jan. 1703. He accompanied his father, William Pynchon (q.v.) to America in 1630, settling in the colony of Massachusetts. He succeeded his father in the government of Springfield in 1652, gained, by purchase and through his father, great tracts of land, and laid out the towns of Northampton, Hadley, Hatfield, Deerfield, Northfield and Westfield. He was eminently successful in gaining and keeping the friendship of the Indians, with whom he negotiated many treaties for the colonies. He was one of the commissioners to receive the surrender of New York from the Dutch in 1664. He was a deputy of the general court of Massachusetts in 1659–65, assisted under the first Massachusetts Royal Charter in 1665–86; and councillor from 1686 until his death.

**PYNCHON, Thomas Ruggles,** American Protestant Episcopal clergyman and physicist: b. New Haven, Conn., 14 Jan. 1823; d. 1904. Graduated from Trinity College in 1841, he was lecturer on chemistry there 1843–47; studied for the ministry, and was ordained priest in 1849. In 1849–55 he was in charge of parishes in Stockbridge and Lenox, Mass., and in 1854 accepted the chair of chemistry and natural science at Trinity College which he held until 1877 when he exchanged for the chair of moral philosophy. He was president of the college 1874–83. In 1874–78 he superintended the erection of the college buildings on the west side of the quadrangle and the transfer of the college to the new site. While in Europe 1855–56 he made a tour through southern France, Italy and Sicily, engaged in geological investigations, made a study of volcanic action, and ascended Mount Ætna at night. In 1902 he became professor emeritus at Trinity. He is a member of the American Academy of Arts and Sciences, was one of the founders of the Meteorological Society, of which he is vice-president, and is connected with various other scientific societies both American and foreign. He has published ‹Treatise on Chemical Physics› (1869); ‹An Examination of Bishop Butler's Analogy› (1890).

**PYNCHON, William,** American colonist and religious writer: b. Springfield, Essex, England, 1590; d. Wraysbury, England, 29 Oct. 1662. He was a man of education, one of the grantees of the Massachusetts charter and came to America with Gov. John Winthrop in 1630. He held various offices in the colony, from 1632 to 1634 acting as treasurer. He first settled at Roxbury as one of the founders of the village and organizers of the church, but withdrew in 1736 with the company led by Rev. Thomas Hooker and Rev. Samuel Stone southward into Connecticut. Pynchon with his family and a small party settled at the junction of the Agawam and Connecticut rivers and founded the town, now the city of Springfield. For several years this place was included in the Connecticut colony and Pynchon sat in its legislature, but in 1641, under Pynchon's influence, the Massachusetts court assumed jurisdiction. In 1650, during a visit to England, Pynchon published a book entitled ‹The Meritorious Price of our Redemption.› In this the author took an anti-Calvinistic view of the atonement and so stirred up the colonists that the book was ordered to be burnt and the author cited to appear before the general court. His letter of explanation was deemed unsatisfactory and after being summoned a second time he left the colony in September 1652 and returned to England. He passed the remainder of his life at Wraysbury, near Windsor. His earlier book was republished with a rejoinder to the Rev. J. Norton, as ‹The Meritorious Price of Man's Redemption› (1655). He also wrote ‹Jews Synagogue› (1652); ‹How the first Sabbath was ordained› (1654); ‹Covenant of Nature made with Adam› (1662). Consult Green, ‹Springfield, 1636–1886: History of Town and City› (1888); Adams, ‹Pynchon Family› (1898).

**PYORRHŒA ALVEOLARIS** or **RIGG'S DISEASE,** a disease of the pericementum about the tooth, leading to receding gums, loose teeth, tooth abscesses and perhaps general body infection. It is of bacterial origin. Various forms of Staphylococci are found in the apical abscesses; micrococcus candicans is one of these. The disease when treated early can be controlled by competent dentists.

**PYPIN, Alexander Nicolaevitch,** Russian scholar, historian and author: b. at Saratov in 1833; d. Saint Petersburg, 9 Dec. 1904. Received his academic education at the University of Saint Petersburg, where he was appointed to a professorship in 1860, resigned two years later to enter the literary field. He contributed largely to the Sovremennik («Contemporary»), 1865–67 and from then until his death to the *Vestrik Evropy* («European Messenger»). His first work, a comparative study of Russian, Byzantine and Roman folk-lore, was published in 1859, followed by a ‹History of Slavonic Literatures› (1865), ‹The Intellectual Movements in the First Half of the 19th Century› and a masterly biography in two volumes of Byelinski, the critic, in 1876. A four-volume work ‹The History of Russian Ethnography,› was published in 1892–94 and the ‹History of Russian Literature› in 1898–99. In 1897 he was appointed a member of The Academy of Sciences of Saint Petersburg, publishing for them the works of Catherine II.

**PYRALIDÆ,** a family of moths (q.v.).

**PYRAMID,** *in architecture,* a structure of masonry generally having a recangular base and four triangular sides terminating in a point. According to Herodotus the Egyptians considered the pyramidal form as an emblem of human life; the broad base was significant of the beginning and its termination in a point of the end of our existence in the present state; for which reason they made use of this figure in their sepulchres. The most remarkable pyramids are those of Egypt and Nubia and those of Mexico. The Egyptian pyramids have for ages been a source of interest and curiosity and are regarded as forming one of the seven ancient wonders of the world. They are built mainly of a hard, rough-hewn limestone, but large blocks of granite are also used, especially on the outside. The four sides are so placed as to face the four cardinal points. Being intended both as monuments and as tombs, they contain one or more sepulchral chambers, quite small compared with the total mass. They appear to date from about 4750 to 3000 B.C. after which none were built. It is believed that most pyramids were begun over a sepulchral chamber excavated in the rock and that the work went on during the lifetime of the king for whom it was intended. A low narrow passage was kept open as the tiers of stone were added, in order that access might be obtained to the central chamber from without, and when the monarch died the work ceased and the last layers were then finished off and the passage closed up. The angles formed by the recession of each superior layer were filled up with small stones and beveled off, so as to give a smooth sloping surface to the sides. The stones used varied in diameter, two to four feet being common, but much larger, well-squared blocks were commonly used in facing. The mechanical skill requisite to quarry these and to raise them to such great heights and adjust them in their proper places continues a matter of universal astonishment. No indication of the mechanical contrivances used for this purpose has been left. The fact that an almost fabulous number of laborers were engaged in erecting these pyramids did not lessen the necessity for the employment of certain machines. The pyramids now standing, all in Middle Egypt, are divided into five groups, containing in all about 40 pyramids. The district in which the pyramids stand begins above Dashur and extends by Sakkara and Memphis along the western margin of the valley of the Nile for about 60 or 70 miles, the last or Gizeh group being but a few miles above Cairo. The group of Gizeh, in the neighborhood of the ancient Memphis, is the most remarkable. It consists of nine pyramids and comprises the three most celebrated monuments of the kind in existence, namely, the pyramid of Cheops, called Khufu or the Great Pyramid; that of Cephren and that of Mycerinus — the last much smaller than either of the others. According to Herodotus the Great Pyramid was built by Cheops. The tendency is to place the date earlier and earlier and one large volume has been devoted by V. P. McCarthy to demonstrate that it is at least 50,000 years old. It is estimated that it took 100,000 men working for 10 years to make a causeway 3,000 feet long, to facilitate the transportation of the stone from the Turah quarries, and the same number of men for 20 years more to complete the pyramid itself. Herodotus further describes the method of building by steps and raising the stones from layer to layer by machines and finally of facing the external portion from the top down. Diodorus calls the builder of this pyramid Chembes or Chabryes and by Manetho and Eratosthenes he is called Suphis. The latter name corresponds to Shufu, deciphered from the hieroglyphics upon some stones discovered by Colonel Vyse in his important investigations of this pyramid in 1835. The pyramid at present covers an area of more than 12 acres. The base is about 750 feet square, but was formerly about 768 feet. The perpendicular height, which before the disappearance of the apex was about 482 feet, is now 451 feet. The area at the top is about 12 yards square. The outer casing of small stones has been removed and the appearance the sides now present is that of a series of ascending steps. By these steps, which number 203, the ascent is made comparatively easy, though the lower ones are 4 feet 10 inches high. The content of solid masonry has been estimated at 82,111,000 cubic feet. The only entrance is on the north face, 49 feet above the base, though the masonry about it has been so much broken away that the débris reaches nearly up to it. A passage 3 feet 11 inches high and 3 feet 5½ inches wide conducts from the entrance down a slope at an angle of 26° 41′, a distance of 320 feet 10 inches, to the original sepulchral chamber, commonly known as the subterranean apartment; it is carried, reduced in dimensions, beyond this a distance of 52 feet 9 inches into the rock, though for what purpose remains a matter of conjecture. The sepulchral chamber is 46 feet long by 27 feet wide and 11½ feet high. From the entrance passage another branches off and leads to several other passages and chambers. One of the latter, known as the queen's chamber, is situated about the centre of the pyramid, 67 feet above the base; it has a groined roof and measures 17 feet broad by 18 feet 9 inches long and 20 feet 3 inches high. The other, called the king's chamber, is reached by an offshoot from the queen's passage, 150 feet long. Its dimensions are 34 feet 3 inches long by 17 feet 1 inch wide and 19 feet 1 inch high. The chamber is lined with red granite highly polished, single stones reaching from the floor to the ceiling and the ceiling itself is formed of nine large slabs of polished granite extending from wall to wall. The only contents of the apartment are a sarcophagus of red granite, which, judging by its dimensions, must have been introduced when the building was proceeding. It is supposed to have contained a

THE GREAT PYRAMIDS, NEAR CAIRO

wooden coffin with the mummy of the king and that these long since disappeared when the pyramids were first opened and plundered. The second pyramid, built by Suphis II or Cephren, stands on a higher elevation than the Great Pyramid. Its original dimensions were 707 feet 9 inches square and 454 feet 3 inches high, but these now stand 690 feet 9 inches and 447 feet 6 inches, respectively, with an angle for its slope of 52° 20′. Part of the outer casing of the pyramid is still preserved. This pyramid has two entrances and the passages to which they respectively give access lead to the same sepulchral chamber, in which is deposited a granite sarcophagus. It was reached with great difficulty by Belzoni in 1818. Belzoni found in it a Cufic inscription recording the visit of the Caliph Alaziz Othman Ben-Yusuf and the opening by him of the pyramid in 1196 A.D. The only remains met with were those of a bull. The third pyramid, built by Menkaré or Men-kau-Ra or Mycerinus, is only 354 feet 6 inches square and 203 feet high. It also was explored by Colonel Vyse in 1837. He discovered several chambers, one of which contained a sarcophagus and a mummy case bearing the name of Men-kau-Ra and also a body, supposed to be that of an Arab. The two latter are now in the British Museum, but unfortunately the sarcophagus was lost by the sinking of the vessel in which it was being transported to this country. This pyramid is the best constructed of the three; it was originally cased half-way up with black granite. The six smaller pyramids which complete the Gizeh group are supposed to form the tombs of some of the relatives of the kings who constructed the larger ones and are of much inferior interest to the three above mentioned. Of the other groups of pyramids that at Abusir contains five; another at Sakkara contains 11, one with a doorway inlaid with porcelain tiles and having a royal name, and a third group at Dashur contains five. Other pyramids are at Meydun and Illahun and there are two at Biahmu. The pyramids of Nubia are very numerous; a single group north of Gebel Barkal comprises no fewer than 120. In Babylonia the Birs Nimrud or Tower of Belus was a kind of a step-shaped pyramid, built of bricks of different colors. It was erected by Nebuchadnezzar and dedicated to the planets. Its height was 235 feet and its circumference 2,286 feet. The Mujellibe in Babylon, of which the ruins are still to be seen, was another pyramidal structure of the same monarch. Ruins of pyramids are to be found at Benares in India and in other parts of the East. Certain monuments of the ancient inhabitants, found in Mexico, are also called pyramids. (See MEXICAN ARCHÆOLOGY). Consult Lepsius, ‹Ueber den Bauder Pyramiden›; Vyse, ‹Operations carried on at Gizeh in 1837›; Petrie, ‹The Pyramids and Temples of Gizeh› (1884); Maspero, ‹L'Archéologie Egyptienne› (1887); McCarthy, ‹The Great Pyramid Jeezeh› (1900); Barber, ‹Mechanical Triumphs of the Ancient Egyptians› (1900); Baedecker, ‹Ægypten› (1814 ed.).

**PYRAMID,** *in geometry,* a polyhedron with a polygon as base and triangular sides meeting in a common point called the vertex. A regular pyramid has a regular polygon for base, while the perpendicular from the vertex to the base passes through its centre. The volume of a pyramid is one-third the altitude multiplied by the area of the base. The perpendicular distance between the base and the vertex is the altitude. The slant height is the height of any of the triangular sides of a regular pyramid. The total area of the sides of a regular pyramid is one-half the perimeter of the base multiplied by the slant height. Pyramids are named according to the nature of their bases; they may be triangular, quadrangular, etc., according as their bases are triangles, quadrilaterals, pentagons, etc. The base and lateral triangles are called faces; the lines in which the faces meet are called edges.

**PYRAMID PEAK,** a name given to two mountain peaks in California and two in Colorado.

**PYRAMUS** (pĭr'ạ-mus) **AND THISBE,** thĭz'bē, a pair of unfortunate lovers whom classical legend represents as living in Babylon. Their parents were enemies and would not sanction the marriage of the lovers, but the two contrived to converse with each other in secret through an opening in the walls of their adjoining houses. They finally determined upon a meeting at the tomb of Ninus. Thisbe was first to arrive, and meeting a lioness who had just killed an ox, she ran away, dropping her mantle in her flight. This the lioness soiled with blood, and Pyramus arriving shortly after and finding the blood-stained garment of his betrothed, imagined her to have been killed and ended his life beneath a mulberry tree, the fruit of which (according to the legend) has since been of a blood-red hue. Thisbe returning finds the body of her lover, whereupon she then kills herself in despair. The legend is embodied in Ovid's ‹Metamorphoses› and is caricatured in the farcical interlude in Shakespeare's ‹Midsummer Night's Dream.›

**PYRARGYRITE,** pī-rär'jĭ-rīt («dark ruby silver»), a rhombohedral mineral, usually of high metallic-adamantine lustre, color black by reflected light, rich ruby-red by transmitted light, hardness 2.5, specific gravity 5.85. It is a silver sulph-antimonite, and may contain 60 per cent of silver. It occurs in magnificent specimens in Germany, Mexico, Chile and Bolivia, and is an important silver ore in these countries and in the mining regions of the western United States.

**PYRENE,** a hydrocarbon product of coal-tar distillation ($C_{16}H_{10}$). Also the name of a commercial fluid for fire extinguishing.

**PYRENEES,** pĭr'ẹ-nēz, a lofty mountain chain forming the boundary between France and Spain. Its length, from Cape Creux, north of the Gulf of Rosas, to the Point of Figuier, near Fuenterrabia, is nearly 270 miles; and the area of its slopes is about 21,000 square miles. The chain is continued across the north of Spain by the Cantabrian Mountains. The direction of the chain is east-southeast, to west-northwest. It does not, however, lie in the same straight line, but rather consists of two lines, which form parallel ridges about 20 miles distant from each other, except near the centre, where they become united by means of a remarkable rectangular elbow, in which some of the loftiest summits are found. Both on the north and south sides numerous branches are thrown off, generally at right angles to the principal axis, and subside rapidly as they recede from it, forming various transverse but very few longitudinal valleys. The chain rises both from the east and west toward the centre; and, in accordance with a general rule which holds in regard to the European chains, which lie in the direction of the equator, the descent on the south side is much more abrupt than on the north. Owing to this, the south has much fewer lakes than the north slope, but far surpasses it in the boldness and grandeur of its scenery. As already observed, the loftiest summits of the chain are near its centre. Its culminating point, Maladetta, situated there, has the height of 11,168 feet, and a great number of peaks in the same locality exceed 8,500 feet. To the east of the centre the chain lowers so rapidly that its average height soon becomes little more than 2,000 feet. To the west the height diminishes much more gradually, and many peaks have heights varying from 5,000 to 7,000 feet, and even 8,000 feet. The principal passes in the Pyrenees formed by the meeting of valleys from opposite sides of the axis, take in the east part of the chain the name of Cols, and toward the centre that of Ports. No fewer than 75 are counted, of which 28 may be crossed on horseback and seven in wheeled carriages. The most frequented are those of Pertus and La Perche in the east and Saint Jean Pied de Port in the west. The nucleus of the chain is evidently granite, which, with the primitive schists which overlie it, constitutes the loftiest summits, with the exception of Mount Perdu (10,994 feet), Marbore (10,673 feet), and some huge adjacent masses which are formed of mountain limestone. The granite, however, seldom forms continuous ridges along the principal axis, but rather appears in a number of remarkable protuberances situated to the north of it. Above the micaceous schist and primitive limestone, which occur in connection with it, lie largely-developed strata of argillaceous schist and transition limestone, forming two great belts parallel to the primitive chain, one on the north and the other on the south side. Above these secondary rocks appear, of which by far the most common is the mountain limestone, which occupies the greater part of the south slope, but on the north side attains little elevation, being there almost entirely confined to the lower heights at the bottom of the principal chain. Above the mountain limestone the principal rocks are Jura limestone and trap. The number of thermal springs existing in the Pyrenees seems to indicate the presence of volcanic agents, but basalt and other rocks of igneous origin are very rare. The minerals of the chain include iron, copper, lead, zinc, manganese, antimony and cobalt. There is no mine either of silver or gold, but particles of the latter are found in department Ariège, and in the streams of several other districts. The only mineral which has hitherto been worked to much advantage is iron. Mineral springs, both cold and thermal, are numerous, and much frequented by visitors. The limit of vegetation on the Pyrenees is about 600 feet higher than on the Alps. The rhododendrons, which in the latter are not found higher than 5,000 feet, are here found at 5,500 feet and alpine plants are found on the loftiest summits bordering on the region of perpetual snow. In the Pyrenees this is found only on the north slope, where it does not, as in the Alps, form a snowy zone, the lower limit of which looks as if traced out by an almost horizontal straight line; but on the contrary, forms large isolated masses, the base of which is often concealed by the mountains in front of them. This makes it difficult to fix the snow-line with precision, but according to the most accurate estimate it is 9,190 feet, or nearly that of Mount Canigou. Glaciers are not numerous in the Pyrenees, and hence the torrents and rivers which rise in the chain are fed chiefly by springs. Those on the south side flow toward the Ebro and are carried by it to the Mediterranean; those on the north side flow partly to the Mediterranean and partly to the Atlantic, the water-shed between the two seas being carried northward by a branch which ultimately links with the Cevennes. The largest river of the chain, and the only one of importance which preserves its name throughout its whole course, is the Garonne. In respect to average height and mass the Pyrenees are unquestionably the second mountain chain of Europe, but its culminating point, Maladetta, has only the third place, being indeed lower than Mulhacen in the Sierra Nevada. Contrary to the general rule, that the loftiest summits of mountain chains are found in the line of the principal axis, Maladetta, Posets (11,047 feet) and Mont Perdu, the three culminating points of the Pyrenees, are situated on the south slope. Basses-Pyrenees, Hautes-Pyrenees and Pyrenees-Orientales are departments in the south of France (q.v.). See also PERPIGNAN, CAPITAL OF P. ORIENTALES.

Consult Taine, ‹Voyage aux Pyrénées,› especially the 4th ed. (1873) with illustrations by Doré; Schrader, ‹Les Pyrénées,› in the ‹Annuaire du Club Alpin français› (1885); De Margerie and Schrader, ‹Aperçu de la Structure géologique des Pyrénées› (1891), and ‹Aperçu de la Forme et Relief des Pyrénées› (1892); Camena d'Almeida, ‹Les Pyrénées: Développement de la Connaissance géographique de la Chaine› (1893); Trutat, ‹Les Pyrénées› (1894); Bubanus, ‹Flora Pyrenæa› (1897–1902); Spender, ‹Through the High Pyrenees› (1898); Roussel, ‹Tableau Stratigraphique des Pyrenees› (1904); Cook, ‹Handbook to Health Resorts on the Pyrenees› (1910); Freeston, ‹Passes of the Pyrenees› (1912).

**PYRENEES, Peace of the,** in European history the name given a treaty concluded between France and Spain by Cardinal Mazarin and De Haro, on the Ile des Faisans, in the river Bidassoa, 7 Nov. 1659, terminating a war which had lasted for 24 years. By this treaty Spain ceded to France Roussillon, with the fortress of Perpignan, etc., so that the Pyrenees have since formed the boundary of the two kingdoms; and in the Netherlands, Artois and part of Flanders, Hainault and Luxemburg, with a number of fortified towns.

**PYRETHRUM,** a group of composite plants formerly considered a genus, but now ranking as a section of the genus *Chrysanthemum.* In garden literature the name is generally restricted to *Pyrethrum roseum,* several hundred varieties of which are widely popular in European gardens. Under the name *Chrysanthemum coccineum* it is extensively cultivated in southern France, California and western Asia for its flowers, which are dried and ground as the material of insect powder. Another species (*C. cinerariæfolium*) is also cultivated for this purpose. The well-known bedding-plant «golden feather» is a variety *C. Prœltum,* but is widely known as *Pyrethrum aureum* among horticulturists. The plants are easy to grow in any good garden soil, if deeply dug and highly enriched. Since the seed is often disappointing in its results, the plants are best propagated from choice varieties by division in the spring. The golden-feather pyrethrum is often propagated by cuttings made during the winter from stock plants.

**PYRGOS,** pĭr′gōs, Greece, capital city of the monarchy of Elis and Achia, 13 miles west of Olympia, on the west coast of the Morea, near the mouth of the Ruphia (Alpheus), on the railroad from Piræus to Olympia, and with branch connections with its harbor, Katakolon. The surrounding country is a fertile plain, growing currants, oranges and grapes. The commune has a population of about 27,000; the town, 13,690. Three other small towns in Greece bear the same name.

**PYRHELIOMETER,** an instrument for measuring the intensity of the heat of the sun's rays. Pouillot's instrument was the first called by this name. It is a form of radiometer, operated on an actinic principle. A vessel containing water was used to float a black box with thermometer bulb sunk in the fluid. The difference between the heat shown under exposure and when the sun's rays were cut off was the basis of measurement. Augstrom's compensating pyrheliometer employs the thermo-electric principle. Two similar metallic strips, as of platinum, are blackened, and one exposed to sunlight while the other is in shade. The difference in electrical resistance of the exposed and the shaded strips is determined by switching on a current, and this permits a determination of the relative temperatures. An improved form used bv the United States Weather Bureau was designed by C. F. Marvin. This employs twin strips of blackened silver, which are alternately exposed to the sunlight for one minute, by the use of a timed shutter. An electric resistance thermometer measures the heat through the difference in electric resistance. Consult Abbot, 'Smithsonian Institution Miscellaneous Collections' (Vol. XVI, 1915).

**PYRIDINE** ($C_5H_5N$), an organic base, originally found in bone oil, as a decomposition product, now known to be obtainable from bituminous coal, petroleum, etc., and also produced synthetically by heating amyl nitrate with phosphoric oxide. The most common source is the lighter oils of coal-tar distillation. It is obtained pure by transformation into one of its salts, followed by repeated crystallizations. When pure it is a colorless liquid, boiling at 114.5° C. (238° F.). It is the base of many valued derivatives. The more important acids obtained are picolinic a., nicotinic a., quinolinic a., cinchomeronic a., carbochincomeric a., and berberonic a. Trigonelline and piperidine are two of the most important commercial derivatives.

**PYRITE,** or **IRON PYRITES,** the commonest metallic mineral, like copper pyrites, is often called «fool's gold,» owing to its resemblance to gold. It may readily be distinguished by its much greater hardness, 6 to 6.5, brittleness, pale brass-yellow color, greenish-black streak, and specific gravity, 4.95 to 5.10. It crystallizes in isometric crystals often of great beauty, but is usually found massive as a vein material or in beds of great extent. It is an iron disulphide, $FeS_2$. Its high sulphur percentage, 53.4, and the ease with which it may be burned, leads to its enormous consumption in the manufacture of sulphuric acid. Owing to its ready oxidation, with the formation of sulphuric or sulphurous acids, it is an active agent in the disintegration of those rocks through which it is disseminated. It frequently contains gold and to some extent other valuable metals. It is not an economic ore of iron, on account of the difficulty of removing the sulphur content. Its most important commercial occurrence is at Rio Tinto, Spain. It is also extensively mined near Rowe, Mass., in Virginia, the Carolinas, Georgia, Colorado and in many other regions. The finest crystals come from Elba, Cornwall in England, Peru, Chester County, Pa., and Central City, Colo. See MINERAL PRODUCTION OF THE UNITED STATES.

**PYRITES,** either of the various metallic sulphides, of which the most important is iron pyrites (see PYRITE). Copper pyrites (see CHALCOPYRITE) is an important ore of copper. Arsenical pyrites (see ARSENOPYRITE) furnishes much of the arsenic of commerce; magnetic pyrites (see PYRRHOTITE) is often an important nickel ore.

**PYRMONT,** pēr′mŏnt, Germany, a celebrated watering-place of Prussia, in the district of Waldeck and Pyrmont, capital of the district; in a beautiful valley at the foot of a range of finely wooded hills, on the left bank of the Emmer, 34 miles south-southwest of Hanover. It contains a palace, in which the Prince of Waldeck and Pyrmont resides during the watering season; and it was much frequented before the war by the aristocracy of Germany; from 10,000 to 20,000 visitors being annually recorded. One of the curiosities of the place is the Dunsthöle or gas grotto, which emits vapors similar in nature and effect to those of the Grotto del Cane in Italy. Pop. about 1,700.

**PYROCLASTIC,** fragmental volcanic material resulting from violent explosive eruptions. The finest particles are known as volcanic ash, or simply as ash. This is not ash in the sense that it is a product of combustion, but is finely divided rock material that has been blown into bits. Volcanic ash has been an important factor in the destruction wrought by volcanic eruptions. It may be wind drifted for long distances. Beds of this ash in the Great Plains of Kansas and Nebraska were probably drifted from the Rocky Mountain region. Volcanic ash is sometimes employed as a base for scouring soaps and polishing powders. Lapilli is much the same as ash, but slightly coarser, averaging about the size of peas. Bombs are larger masses of lava hurled from the craters, often in a partly molten state, in which case they are rendered rounded by the whirling motion they assume in the air.

**PYROGALLIC ACID, PYROGALLOL, TRI-OXY-BENZENE,** $C_6H_3(OH)_3$, (1:2:3), is produced by the action of heat on gallic acid, carbon dioxide being eliminated in the process.

Fine colorless needles or plates, readily soluble in water, less so in alcohol or ether, melting point 132° C. Valuable because of its great affinity for oxygen, its alkaline solution is used to absorb oxygen in gas analysis. It is used extensively as a photographic developer, but has the disagreeable power of darkening the skin. It forms a number of derivatives, some being valuable in the treatment of skin diseases.

**PYROGRAPHY,** from πυρ, fire and γραφειν, to write, literally to write by fire. A method of making impressions on wood, leather, etc., by means of heated metal tools or burnt sticks. The art was early practised by the Egyptians who used crude iron bars that had been previously heated in fire. A modern form of pyrographic apparatus consists of a tube about six inches in length and about half an inch in diameter provided at its lower extremity with a screw-cap and a small support. At the other end there is a rod to which the drawing point is affixed. For the formation of the combustible gas and heating of the rod sulphuric ether is usually employed. The gas when generated is forced to the metallic point by means of air pressure, and after the flame has been regulated a person may work for two consecutive hours at an expense of about one-half cent per hour. The vapors disengage themselves constantly and feed the small flame which is barely perceptible. The heat is always uniform, and even on leather a sure and sharp execution of the design is possible. Electrically heated points are also used. The effects produced by the pyrograph are equal in many respects to the fine crayon drawings, and when colored and varnished present a very pleasing effect. The finest and most delicate lines can be drawn and there is no danger of burning holes in the material. The right hand being engaged in the execution of the piece to be ornamented leaves the left free to turn the object in any desired position while the work is in progress.

Pyrography is taught in many trade schools, and is used mainly for ornamenting leather and wood. Consult Bolas and Leland, ‹Pyrography and Wood Roasting› (1899); Maude, ‹Pyrography› (1891).

**PYROLIGNEOUS ACID,** an impure, dilute form of acetic acid obtained by the dry distillation of wood. The foliaceous trees, especially the beech, or the oak and birch, which latter having been deprived of their bark are better adapted for its manufacture than the conifers. The dry distillation of wood is accomplished in iron airtight retorts, of which there are many styles; and in accordance with the temperatures employed varying products, which are partly gaseous and partly liquid, are formed. The gases are consumed and the liquid component separates into two layers of which one is aqueous and dark brown, containing the wood vinegar, while the other is oily, almost black, containing wood tar. During distillation the first distillates, which contain very little acid, pass over at 175–235° F. (79–113° C.) while at 288° F. (142° C.) the lighter oils pass. As soon as the water shows a sufficient content of acid the temperature is raised to 315° F. 157° C). Above that temperature the heavier oils distil over. The quantities received vary, as has been said, according to the temperature employed: in general about 35 per cent of pyroligneous acid; 20 per cent of wood tar and 33 per cent of charcoal are the products.

Pyroligneous acid, as it is received from the still, is a reddish brown fluid having a rather disagreeable, sour, smoky, empyreumatic odor and taste. It is a very complex product, containing besides acetic acid, all the homologues of acetic acid from formic to caproic acid; methyl alcohol, acetone, metacetone, aldehyde, etc.

Commercial acetic acid is prepared chiefly from pyroligneous acid purified by distillation and strengthened by rectification, the acetic acid obtained by the oxidation of ethyl alcohol being of limited concentration and used principally for table use, and preserving food articles. The crude pyroligneous acid is used for the preservation of wood and ropes, for embalming, in veterinary surgery for many diseases, and in some of the arts, as in calico printing.

**PYROLUSITE,** the most important ore of manganese. It is a black or gray mineral of brilliant metallic lustre. It is distinguished from manganite and polianite, which it much resembles, by being so soft (hardness 2 to 2.5) as readily to soil the fingers. Its black streak further separates it from manganite. While its crystallization is orthorhombic, it is usually massive or radiating-columnar. Chemically it is manganese dioxide, $MnO_2$. It has long been used in the manufacture of chlorine and oxygen, and in decolorizing glass; its present most important use is in the preparation of manganese steel. It occurs abundantly in Thuringia and elsewhere in central Europe, also in Nova Scotia and Brazil. In the United States it is mined in Virginia, Georgia and Arkansas.

**PYROMANIA,** incendiary monomania, a form of insanity characterized by an irresistible desire to destroy by fire. In most forms of mental disease self-control is lost, but in pyromania the loss of the power of inhibition is the chief symptom; hence the affection is sometimes spoken of as a form of inhibitory insanity, a psycho-neurosis caused by decreased psychological tension. The desire to commit arson manifests itself during certain periods between which the pyromaniac is sub-lucid and may even attend to his affairs, although he exhibits some nervousness or hysteria. Usually a period of depression precedes an attack. See INSANITY.

**PYROMETER,** an instrument for measuring temperatures higher than the boiling-point of mercury (350° C.). Regnault and other careful experimenters employed the expansion of air and vapors in measuring high temperatures. These pyrometers can only be used in a laboratory; for use in a manufactory less accurate methods of measurement have to be employed. In Wedgwood's pyrometer (1782) it was assumed that dry clay, when exposed to heat, contracted regularly, and the instrument was constructed on this principle; but it is now known to be untrustworthy. An instrument in which the expansion of a metal bar (generally of platinum) was magnified by means of levers has often been employed to measure the temperature of a furnace. Morveau, Brongniart and Daniell invented instruments on this principle. The thermo-electric law of Tait may be used to calculate the temperature to which a junction of copper and iron has been subjected, the electric current produced being measured by a galvanometer. In this way high temperatures have been measured with considerable accuracy. By Siemens' method temperatures are measured by observing the increased electric resistance of a platinum wire when heated, two coils of the same kind of wire being prepared so as to have equal resistances at the same temperature, their ends connected by rather long thick copper wires and the current from a constant battery passing through them measured by means of a galvanometer. One of the coils is kept at a known temperature, the other has the temperature which it is desired to measure. The law discovered by Siemens —

$$R=a\sqrt{T}+\beta T+\gamma$$

where R is the resistance at the absolute temperature T, and where $\alpha$, $\beta$ and $\gamma$ are certain numbers, enables the temperature to be calculated. Pouillet determined the following temperatures by means of an air-thermometer. They correspond to the stages of incandescence of a metal bar.

| | |
|---|---|
| Incipient red-heat | 525° C. |
| Dull red | 700° |
| Cherry red | 900° |
| Dark orange | 1100° |
| White | 1300° |
| Dazzling white | 1500° |

In potteries cones and rings of clay are employed to measure temperatures. The cones are made to soften at a known heat and the rings indicate rising temperature by expansion. For optical purposes pyrometers are made to indicate by showing metallic colors that are compared with a standard. A simple form of pyrometer measures radiation and operates a pointer by a bimetallic spring. The thermo-electric principle is now employed in recording pyrometers that may be located at a distance from the furnace. See THERMOMETRY.

**PYROMORPHITE**, a mineral occurring in hexagonal crystals, often cavernous and barrel-shaped, or in curious, nearly parallel groups tapering to a point. It is a lead phospate and chloride and occasionally occurs in sufficient quantities to be an important lead ore. Its hardness is 3.5 to 4, specific gravity 6.5 to 7.1, color commonly green, yellow or brown, lustre resinous. Its most notable occurrences are Ems, Germany; Cumberland, England; Broken Hill, New South Wales, and in the United States formerly at Phœnixville, Pa.

**PYROPE**, or **BOHEMIAN GARNET**, a fine dark-red magnesium-aluminum garnet, often called «precious garnet» because of its extensive use as a gem. It is slightly yellower than the true ruby. Peridotite, or serpentine derived from it, is the usual matrix of pyrope in Bohemia and in Kimberly, South Africa, but more commonly it occurs as rounded pebbles loose in the sands, as in the ant-hills of the Navajo Reservation in Arizona. It is also found in Colorado, New Mexico and Kentucky, in Scotland and Brazil. It is often incorrectly called «ruby.» Consult Kunz, 'Bohemian Garnets,' trans. 'Amer. Inst. Mining Engineers' (1893). See CARBUNCLE; GEMS.

**PYROPHONE**, a musical instrument, in which the various notes are produced by the burning of hydrogen gas within glass tubes of various sizes and lengths. It is also called a flame-organ and was invented about 1875 by a Frenchman called Kastner.

**PYROPHYLLITE**, or **PENCIL STONE**, a mineral of soapy feel, the compact form of which is extensively mined in North Carolina as soapstone. Its uses are the same as those of the related mineral talc (q.v.). Some of the algamatolite used by the Chinese for carving into pagodas and images is pyrophyllite. The mineral is usually found in coarse lamellar radiations, occurring thus in fine specimens in Switzerland, Georgia, North Carolina and California. Chemically, it is a hydrous aluminum silicate.

**PYROSCOPE**, an instrument for measuring the intensity of heat radiating from a hot body, or the frigorific influence of a cold body. It is commonly constructed on the principle of a differential thermometer. Compare PYROMETER.

**PYROSIS**, or **WATERBRASH**, a burning sensation in the epigastrium, usually followed by an acrid watery discharge into the mouth. It is a symptom of indigestion, and when felt simply as heat, without rising, is mistermed heartburn. It arises from an excess of hydrochloric acid in the stomach. A reduction of the acid and avoidance of starchy foods are the recognized forms of treatment. See DYSPEPSIA.

**PYROTECHNICS**, the art or business of manufacturing or displaying fireworks. The common ingredients are nitre, sulphur and charcoal, together with filings of iron, steel, copper, zinc and resin, camphor, lycopodium, etc. Gunpowder is used either in grain, half crushed, or finely ground, according to the desired effect. The proportions of the materials differ very much according to the speed of combustion and the color of flame desired, and the utmost care and precaution are necessary in the manufacture. Lampblack produces a very red color with gunpowder, and a pink with nitre in excess. Yellow sand is introduced to secure golden showers. Verdigris imparts a pale green, sulphate of copper and sal-ammoniac a palm-tree green. Camphor produces a very white flame, with aromatic perfumes, which mask the bad smell of the other ingredients; benzoine and storax are also used on account of their agreeable odor. Lycopodium, which is often used in the manufacture of stage-lightning, burns with a rose color and a magnificent flame. The familiar types of fireworks are: (1) set pieces, that give off showers of colored sparks or flame, sometimes elaborately arranged to form pictures of fire in the air; (2) pinwheels, that discharge products of combustion from radiant spokes, and so rotate a burning wheel supported by a central pin; (3) rockets, that are held by a light stick, discharged rearward, the reaction carrying them off in the air (a description of sky-rockets will be found under PROJECTILES); (4) Roman candles, that discharge flaming colored balls or stars or bombs; (5) firecrackers, small paper cylinders having a charge of gunpowder ignited by a fuse. Nearly all of these are confined in cylindrical pasteboard cases, with a fuse of paper cord enclosing a fine train of quick-burning powder. Great ingenuity has been expended in obtaining beautiful effects in pyrotechny. The indiscreet use of fireworks by boys and incompetent persons resulted in so many accidents, especially on the fourth of July, in the United States, that «fireless fourths» have resulted in most large cities, and the tendency is to confine exhibitions of pyrotechnics to displays under the management of trained experts, the combustibles being so placed that they are largely shut off from any crowd of spectators.

**PYROXENE,** a mineral formed commonly in crystalline limestone or dolomite, in serpentine and in rocks of volcanic origin. Less abundant in granite rocks and metamorphic schists. Crystalline form, rhombic, monoclinic or triclinic. Brittle. Hardness, 5 to 7. Specific gravity, 2.8 to 3.7. Of a vitreous or resinous lustre. Color is usually some dull shade of green, but may vary to nearly colorless or to brownish black. Composition an isomorphic mixture metasilicates, $RSiO_3$, where R is Ca, Mg, Fe, sometimes Mn or Zn, rarely the alkali metals. Important varieties of pyroxene are diopside, hedenbergite, schefferite, augite. Pyroxene is one of the most important of the rock-forming minerals being an essential constituent of basalt, diabase trachyte, syenite, gabbro, pyroxenite and many other rocks. It is thus widely distributed in all parts of the world. Especially fine crystals occur in the Piedmont, in Sweden, northern New York and southern Canada and in New Jersey.

**PYROXYLIN.** See GUN-COTTON.

**PYRRHIC** (pĭr ĭk) **DANCE,** a famous war-dance of antiquity. It was danced to the sound of the flute, and its time was very quick and light. It was introduced into the Roman public games by Julius Cæsar, and was danced by male and female dancers, having much of a dramatic character.

**PYRRHIC VICTORY,** a victory so dearly bought that it is almost a defeat, so called from the defeat of the Romans at Asculum 279 B.C. by Phyrrhus. See PYRRHUS.

**PYRRHO,** pĭr'ō, Greek philosopher: b. Elis, about 365 B.C.; d. about 270 B.C. He was a pupil of the Democritean philosopher Anaxarchus of Abdera, whom he accompanied to India in the train of Alexander the Great. During this journey he became acquainted with the doctrines of the Brahmans, Magi and other eastern philosophers. His doubts concerning positive knowledge were strengthened as he proceeded in his studies, until at length he came to hold all knowledge uncertain, and considered virtue alone as valuable. In all disputes his answer to his opponents was, «What you say may, or may not, be true; I cannot decide,» and he taught in his school that truth could not be attained, and that we must be content to suspend our judgment on all subjects. He spent much of his life in solitude, and by abstaining from all decided opinions concerning moral and physical phenomena, endeavored to attain a state of tranquillity unaffected by fear, joy or sorrow. His countrymen, the Abderites, made him high-priest, and exempted all philosophers from the payment of taxes. The Athenians erected a statue in honor of him, and his countrymen raised a monument to his memory. His skepticism is easily accounted for. His master, Democritus, held that except the immediate elements of bodies (atoms) nothing was real, and that all perception was subjective. He was confirmed in these views by the doctrines of Socrates, to whom, in his character, he bore great resemblance, and his skepticism is allied to the irony of that philosopher. Led by his temperament and manner of life to esteem uninterrupted tranquillity the great object of all philosophy, believing that nothing tended so much to destroy this quiet as the interminable disputes of the schools of the dogmatists, and that uncertainty was increased by their contentions, he determined to seek in some other way the peace which he despaired of finding in dogmatical philosophy. A disposition to doubt is often called, from this philosopher, Pyrrhonism. Consult Überweg-Prachter, ‘Grundriss der geschichte der Philosophe’ (Berlin 1914).

**PYRRHONISTS.** See RELIGIOUS SECTS.

**PYRRHOTITE,** pĭr'o-tīt, or **MAGNETIC PYRITES,** a metallic mineral, in composition an iron sulphide, probably $Fe_{11}S_{12}$, differing from common iron pyrites, $FeS_2$, in percentage composition, in being attracted by the magnet, in its bronze color, inferior hardness (3.5 to 4.5), and specific gravity (4.6). It rarely crystallizes in hexagonal, tabular crystals; usually it occurs massive. Though pyrrhotite contains over 60 per cent of iron and nearly 40 per cent of sulphur, it is only very recently that it has been regarded as of any value for these ingredients. Its commercial value was due entirely to the occasional presence as an impurity of varying percentages of nickel. Formerly the deposits of nickeliferous pyrrhotite at the Gap Mine, Pennsylvania, were extensively worked, but the far richer and more extensive deposits at Sudbury, Ontario, are now the chief sources of nickel. Enormous beds of copper-bearing pyrrhotite, nearly free from nickel, are successfully worked in Vermont. Choice crystallized specimens are found in Austria, Brazil and at Tilly Foster, N. Y.

**PYRRHUS,** pĭr'ŭs, Greek military leader, king of Epirus: b. about 318 B.C.; d. Argos, 27 B.C. He was the son of Æacides, who traced his descent from Pyrrhus, son of Achilles. He spent an eventful youth, regained the throne from which his father had been deposed, and was himself expelled several years later. He became the friend of Demetrius Poliorcetes, whom he accompanied on the fatal campaign closed by the battle of Ipsus (301 B.C.), then proceeded to Egypt as hostage for Demetrius, and there married Antigone, daughter of Queen Berenice. With the aid of Ptolemy Soter he recovered his kingdom (296), agreeing to share the sovereignty with Neoptolemus, who had been king since his expulsion, but soon after put his colleague to death, and succeeded by courage, affability and generosity in gaining the admiration of his soldiers and people. He temporarily conquered Macedonia, and in 280 went to southern Italy at the head of a large army to assist the Tarantines against the Romans. Near Heraclea, on the Siris, the consul M. Valerius Lævinus was defeated by Pyrrhus, whose elephants played an important part in the conflict, his loss being so great that he is reported as saying «Another such victory and I must return to Epirus alone.» After having approached within 24 miles of Rome he returned to Tarentum. In 279 he again defeated the Romans, but was glad to accept the offered truce, and passed with his army into Sicily, where he assisted the Greeks against the Carthaginians. At first he met with brilliant success; but his attack upon Lilybæum failed. The war ended in the following year with the total defeat of Pyrrhus by the Romans under Curius Dentatus, near Beneventum. On this occasion the famous elephants of Pyrrhus rushed back upon his own army and contributed to his loss. He reached Epirus with a small remnant of his once splendid army. Nothing daunted, he again invaded Macedonia, and became its king a second time. He afterward turned his arms against Sparta, but was driven from before the walls of that city. In a night attack made upon Argos he was stunned by a tile thrown by a woman from a house-top, and being recognized by the enemy's soldiers was slain.

**PYRUS,** or **PIRUS,** a genus of fruit-bearing shrubs and trees of the rose family. There are about 40 species, natives of the southern hemisphere and especially of the cool temperate parts. They have usually simple leaves, clusters of showy white, pinkish or bluish flowers after the leaves appear, and fleshy fruits (pomes). Horticulturally this is one of the most important of plant genera, since it includes the apple, pear, quince and medlar (qq.v.). The last two, however, are often separated into distinct genera. Some of the species, as crab-apples, are cultivated for ornament.

**PYTHAGORAS,** pĭ-thăg'ō-ras, Greek philosopher: b. Samos, about 582 B.C.; d. about 507. His Father, Mnesarchos, was a merchant (probably of Tyre or some other Phœnician city) who traded with Samos, where he received the rights of citizenship, and settled with his family. The biography of Pythagoras is mingled with many fables. He received his first instruction from Creophilus in his native city. He then went to the island of Scyros, and was a scholar of Pherecydes till the death of the latter; others make him also a scholar of Thales and Anaximander. Iamblichus says that Pythagoras, during his journey to Egypt, spent some time in Phœnicia in intercourse with the successors of Moschus, and other priests of the country, by whom he was initiated into their mysteries, and that he traveled through various parts of Syria in order to become acquainted with the most important religious usages and doctrines. He is said to have been recommended by Polycrates, king of Samos, to the Egyptian king Amasis. In Egypt he became acquainted with the whole range of Egyptian learning. He remained in Memphis and Thebes 22 years, and was in Egypt when that country was conquered by Cambyses. Like many others of the sages in that kingdom, he was carried captive to Babylon, where he conversed with the Persian and Chaldæan Magi; and traveled as far as India, and visited the Gymnosophists. After his return he opened a school at Samos, in which he taught his doctrines in a symbolic form, in imitation of the Egyptians. He also visited Crete, where the priests of Cybele took him to the caverns of Ida, in which Jupiter had been cradled. Here he met Epimenides, whom he initiated into the sacred mysteries of the Greeks. From Crete he went to Sparta and Elis, and from thence to Phlius, where, being asked by King Leon what was his profession, he replied that he was a philosopher (or lover of wisdom), declaring that the name of sage (*sophos*) belonged solely to the Divinity. With augmented knowledge he returned home, where he now founded a philosophical school with great success. He laid claim to supernatural powers, and his extraordinary qualities gained over great numbers of the noble and wealthy classes. Three hundred of these were formed into a select fraternity or order, which has been frequently compared with the still more famous order founded by Loyola in modern times. The members were bound by a vow to Pythagoras and each other, for the purpose of cultivating the religious rites and ascetic observances of their master, and of studying his system of philosophy. They thus formed at once a philosophical school and a religious order, which in time also assumed the character and exercised the influence of a political association. This influence, which became very considerable, was constantly exerted in the interest of the aristocratic party. The democratic party (perhaps, also, at times, an unfriendly aristocratic faction) reacted against the growing power of the order. At the head of this opposition party in Crotona was Cylon, a rich and respectable citizen, whose enmity Pythagoras had excited by refusing to receive him among his scholars. In revenge Cylon once attacked the house of Milo, where a number of Pythagoreans were assembled, surrounded it with his partisans and set it on fire. Forty persons perished, and but few escaped. Pythagoras was probably not in the house. Other authorities set down this event long after the death of Pythagoras, who, they say, was simply banished by Cylon to Metapontum. He fled to the Locrians, and when these refused to receive him, to Metapontum, where, according to tradition, he perished from hunger. For his system of philosophy see PYTHAGOREANISM. Consult Burnet, J., 'Early Greek Philosophy' (2d ed., London 1908); id., 'Greek Philosophy' (London 1914); Cantor, M., 'History of Mathematics' (Leipzig 1900); Fink, K., 'Brief History of Mathematics' (Chicago 1900); Gomperz T., 'Greek Thinkers' (London 1901–05); Gow, J., 'Short History of Greek Mathematics' (New York 1884); Milhaud, 'La Science Grecque'; id., 'Philosophes géomètres'; Ueberweg, F., 'History of Philosophy from Thales to the Present Time' (2 vols., New York 1884); Windelband, W., 'History of Ancient Philosophy' (New York 1899); Zeller, E., 'Die Philosophie der Griechen in ihrer geschichtlichen Entwicklungen' (5th ed., Leipzig 1892; English trans. by Alleyne, S. F., of 4th ed., 2 vols., London 1881).

**PYTHAGORAS OF RHEGIUM,** rē'jĭ-ŭm, Greek sculptor: b. Samos toward the end of the 5th century before Christ. He was noted for his skill in giving the finest and justest proportions to his statues which often represented the human body in attitudes most difficult to represent. Such were his 'Limping Philoctetes' (in bronze); his 'Apollo in Combat with the Dragon'; his 'Duel of Eteocles and Polynices'; 'Europa and the Bull.' His favorite subjects were victors in the public games, and it was his habit as an artist to elaborate the details of his figures; he was learned as an anatomist, and in his statues the hair, sinews, and even veins were represented with life-like distinctness and individuality.

**PYTHAGOREAN THEOREM,** the 47th proposition of the first book of Euclid's Elements, which shows that in any right-angled triangle the square on the hypothenuse is equal to the sum of the squares on the other two sides.

**PYTHAGOREANISM,** the philosophical doctrine of the Pythagoreans, or followers of Pythagoras (q.v.). The system of the Pythagoreans was comprehensive and included a theory of being, that is, a religious cult; a metaphysic; a cosmological theory, and a mathematical theory.

**Pythagorean Cult.**— The Pythagoreans believed in immortality and the transmigration of souls. As they consequently considered all animals to partake of human nature, they forbade the eating of flesh, and even that of beans, which they somehow associated with flesh. They formed a close corporation, and it was considered sinful to reveal any imperfections in the mathematical work of the school to those outside.

**Pythagorean Metaphysics.**— The Pythagoreans taught that the essence of all things was number; that everything in its final analysis could be resolved into number. This statement, which is recorded in Aristotle's Metaphysics, where he is enumerating the Greek schools of philosophy, has occasioned much dispute. We may perhaps see in this doctrine the basis of the 10 antitheses of Pythagorean teaching, especially that of the opposites, odd and even, the definite and indefinite, which are placed first in the list. Number was also an idea in which these opposites were each included, and was, therefore, sometimes spoken of as harmony. But other interpretations of the Pythagorean number make unity and duality as the root notion, and pronounce that these terms may be reduced to the opposition of the spiritual and corporeal, of form and of substance, of the Supreme Being and the material world. The Deity is the one, the Original Unity, the Infinite, out of which all finite things have come. The opposition between the limited or finite and the unlimited or infinite is by some philosophers regarded as the fundamental idea in the Pythagorean number. It is possible that the doctrine was from the first propounded as a vague generalization which might be and was interpreted in different ways by different members of the school. It is evident that nothing can exist without number, as is stated in the apocryphal Book of Wisdom, in some respects a product of Alexandrian Neo-Pythagoreanism. The numbers themselves are divisible into odd and even, thus suggesting the contrast between the limited and unlimited, the conditioned and the unconditioned, the relative and the absolute, matter and spirit, man and God. On the other hand, it is possible that the Pythagorean number was not arithmetical but geometrical. The great disciple of Pythagoras in the time of Socrates was Philolaus, but of the writings in which he expounded his views only fragments survive, and these are of doubtful authenticity. Philolaus may have been under the influence of Democritus, and his theory of number have been based on geometrical axioms and the intervals in the sounds struck from the seven-stringed lyre. Probably he was an atomist. The individual atom would in that case represent to him a material spatial point, two of which made a line, three a surface, four a solid; of these solids, represented always by even numbers, the constitutents of earth were cubical; those of fire tetrahedral, those of water icosahedral, etc. From the use of numbers as the ontological basis of things the passage was easy enough to the wild and fanciful application of them as mere symbols. Thus the later Pythagoreans made the soul correspond with the number six, while seven was the counterpart of reason and health. The imagination here stepped in and with curious ingenuity labored to give a rational basis to these axioms. Hence the famous oppositions of this philosophical sect; namely (1) limited and unlimited; (2) even and odd; (3) one and many; (4) right and left; (5) male and female; (6) rest and motion; (7) straight and crooked; (8) light and darkness; (9) good and evil; (10) square and rectangle. It will be perceived that in these oppositions the idea of completeness, as represented by an even number, and incompleteness by an odd number is the ruling element, and in the idea of incompleteness is implied the potentiality of indefinite extension, multiplication or variation. From the very beginning of Pythagoreanism many semi-mystical, semi-scientific speculations were made concerning square numbers; triangular numbers, of the form $\frac{X^2+3X+^2}{2}$, representing triangular regularly spaced aggregates of points; and rectangular numbers of the form $X^2+X$, representing rectangular aggregates of points.

**Pythagorean Cosmology.**— Pythagoras, or at least the Pythagoreans, had some vague idea of a heliocentric solar system. They taught that the universe had as its centre a fire round which the earth and stars revolved. This central fire was not identified with the sun; the stars were luminous from reflecting its light. They taught that this fire was not visible from the earth; that there was a counter earth which made up with the five known planets, the fixed stars, sun and moon, 10 celestial phenomena. The distance of the spheres from the central fire was determined according to simple numerical relationships. The harmony of the spheres was a melodious sound resulting from the revolution of the heavenly bodies in accordance with the intervals of their distance from the central fire. The Pythagoreans discovered the connection between the length of the string in a lyre and the character of the note which was sounded on percussion, and developed a theory of the musical scale. Indeed this seems to have been the source of their medical and mathematical researches.

**Pythagorean Geometry.**— The Ionic school of Greek philosophy imported geometry from Egypt into the Greek world of intellectual activity. Its early development in Europe was mainly due to the followers of Pythagoras, who himself enunciated the theorem now known as the 47th proposition of the first book of Euclid, which says that the square of the hypothenuse of a right angled triangle is the sum of the squares on its legs. The three propositions, arithmetical, geometrical and harmonical, were known to them, having been introduced into Greece by Pythagoras, who learned them from the inventors, the Babylonians. (See Neo-Pythagoreans; Pythagoras). Consult Burnet, 'Greek Philosophy' (Part I, London 1914); Gomperz, 'Greek Thinkers' (tr. New York 1901); Zeller, 'Die Philosophie der Griechen in ihrer geschichtlichen Entwicklungen' (5th ed., Leipzig 1892; tr. London 1881).

**PYTHEAS**, pĭth'ĕ-as, Greek navigator: b. Massilia (Marseilles) in the 4th century B.C. He made two voyages of discovery along the western coast of Europe from Gibraltar to Iceland. The first voyage extended along the western coast of Europe, through the English Channel, and after somewhat extensive explorations in Britain he proceeded northward and reached Thule, which seems identical with Iceland. Here he was deterred from farther advance by dense fogs and considered himself to have reached the point where the earth ended. He described the fog as a molluscous substance, in which earth, air and sea mingled and in which the universe was suspended. His second voyage seems to have extended along the coast of Denmark and to the Baltic. His accounts of his voyages were received as fables by the ancients, and though celebrated as a navigator and mathematician, little is known of him excepting through the brief and adverse criticism of later writers, among whom are Strabo and Pliny. His accounts were without doubt in the main correct, but the loss of his works makes it difficult to ascertain his real status. He was said to have been the first to determine the sun's meridian altitude at Marseilles at the summer solstice by means of a gnomon. The scanty fragments remaining of his writings were published by Arvedson (1824); Mullenhoff, 'Deutsche Alterthumskunde' (Berlin 1870).

**PYTHIAN GAMES**, in ancient Greece, a name given one of the four national festivals of games, instituted in early times in honor of Apollo, the conqueror of the python. They were celebrated in the neighborhood of Delphi (formerly called Pytho), in the Crissæan fields, which for this purpose contained a hippodrome or race-course; a stadium of 1,000 feet in length, and a theatre, in which the musical contests took place. According to the popular mythological legend the Pythian Games were instituted by Apollo himself. They seem to have been originally only a musical contest, which consisted in singing a hymn to the Pythian god. Until about 586 B.C. they were under the management of the Delphians and took place at the end of every eighth year; but after that date they were conducted by the Amphictyons and were celebrated at the end of every fourth year and prizes were added for flute-playing, athletic sports and horse and chariot racing. Eventually contests in tragedy and other kinds of poetry, painting, sculpture and historical narratives were introduced. At first the prizes were silver or gold, but afterward they consisted of the laurel wreath and the symbolic palm-branch. The statues of the victors were erected in the Crissæan plain. They continued to be celebrated, it is believed, until the end of the 4th century. Consult Gardiner, 'Greek Festivals and Sports' (1910).

**PYTHIAS**, pĭth'ĭ-as. See Damon and Phintias.

**PYTHIAS, Knights of.** See Knights of Pythias.

**PYTHON**, in Greek mythology, was the son of Gæa, an enormous serpent which was produced from the mud after the flood of Deucalion. It lived in a cave on Mount Parnassus and was slain a few days after its birth by Apollo. Python really represents the fogs and vapor-clouds which arise from ponds and marshes and are dispersed by Apollo with his shafts — the rays of the sun. Consult Pascal, C., 'Studii di antichità e mitologia' (1896).

**PYTHON**, a serpent of the subfamily *Pythoninæ* of the boa family. Pythons differ little from boas (see Boidæ), but, except a small, aberrant species in Mexico, are found in Africa, India and eastward to Australia. They rival the boas (q.v.) in size and strength and have similar habits, hanging motionless from trees by their prehensile tails or lurking in the grass or in water where animals are likely to come or at the drinking places. They are especially fond of rocky places, affording snug retreats and are generally known in Africa as «rock-snakes.» Hence they pounce on their victims, which are instantly enveloped in folds of their flexuous and muscular bodies and crushed and rolled into a compact mass. Greatly exaggerated stories are told of the huge creatures these serpents are able to swallow, but, although a tiger or an ox might be killed by the great Indian python, a crushed dog or goat (horns and all) is the limit of its power to eat. The process of swallowing is very slow and many weeks may elapse before another meal is desired. In fact, however, small rodents and birds form the greater part of their fare and these are more frequently caught. These great serpents are justly dreaded by the natives of the regions they inhabit and the literature of travel, ancient and modern, abounds in narratives of their terrible deeds, and many legends and superstitions have clustered about them, especially in the Orient. Few trustworthy records exist of their having attacked human beings, however, and most of the species are readily tamable. They are nocturnal in disposition, hiding in holes or shady tree-tops during the day.

All pythons lay from 50 to 100 eggs on the ground in some dry, grassy place, and the female coils about them, guarding and warming them for about two months when they hatch. The boas, on the contrary, bring forth their young alive.

The biggest pythons are those of southern Asia, the first place belonging to the netted python (*Python reticulatur*) of Indo-China and the Malay Archipelago, which sometimes exceeds 30 feet in length and is perhaps the largest kind of serpent known. It is light yellowish brown with squarish black markings and its skin glitters in the sunlight with splendid prismatic hues. It abounds in hot, low-lying regions and has a savage disposition. Its rate of growth is slow and it probably lives to a great age. The adigar (*P. molurus*) of all India, Ceylon and Malaya, reaches nearly the same length and is of heavier build; it varies from yellowish to dark brown in ground-color, with elongate, irregular dark blotches. The three African species known as «rock-snakes,» are smaller, none exceeding 18 feet long. One of them, the royal python (*P. regia*), dark brown, with a row of light spots along the back, is the species most often seen in traveling menageries. Another (*P. sebæ*) is called «fetch-snake,» on account of the superstitious regard paid it by the negroes of the West Coast. It is marked with many dark zig-zag cross-bars and a dark line along the spine. Australia possesses several pythons, which are smaller and more active than the tropical species. Two, the carpet-python and the diamond snake, are common and well known; they are pests of the poultry-yard, but useful as destroyers of rats and rabbits.

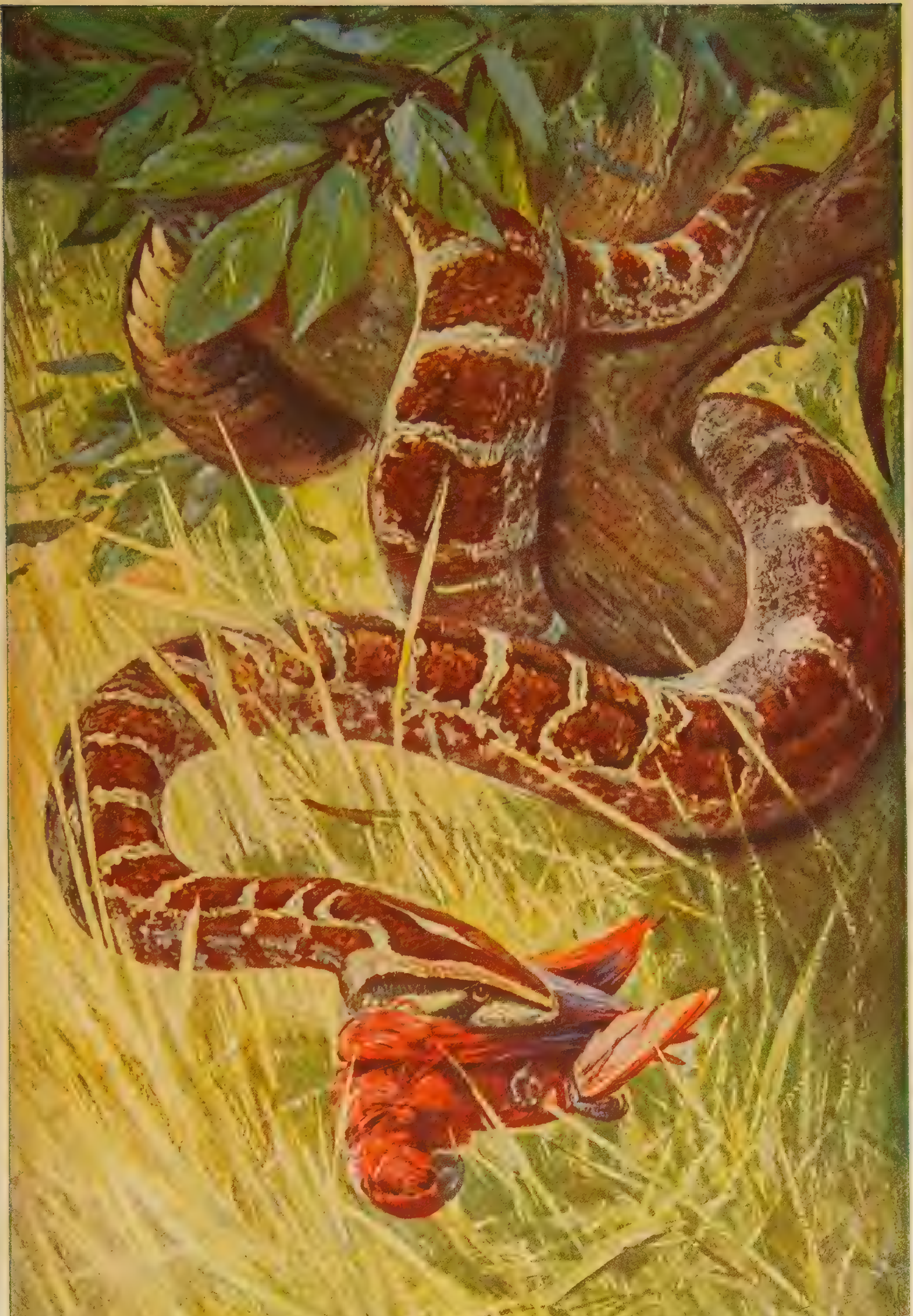
ERNEST INGERSOLL.

**PYTHONINÆ.** See BOIDÆ; PYTHON.

**PYTHONOMORPHA**, a suborder of fossil marine reptiles whose remains are found in Cretaceous rocks of Europe, the Americas, New Zealand and South Africa. There are about 120 vertebrae in the vertebral column. The skull was long and much resembled that of the lizard. The two pairs of limbs were used as paddles in swimming. The mouth permitted these reptiles to seize large prey which they held by means of their stout conical teeth. Kansas has yielded many well-preserved specimens from its chalk-beds. Complete skeletons measuring 30 feet in length have been found. The chief divisions of the Pythonomorpha are Tylosaurus, Platecarpus, Clidastes and Mosasaurus. The last named was the largest member of the group, sometimes reaching a length of 40 feet. Consult Osborn, Henry Fairfield, ‹A Complete Monasaur Skeleton› (in ‹Memoirs of the American Museum of Natural History,› Vol. I, part iv, New York 1899); Von Zittel and Eastman, ‹Textbook of Palæontology› (Vol. II, New York 1902); Williston, ‹On Monasaurs, etc.› (in *Kansas University Quarterly*, Vol. II, Lawrence 1893); id., in ‹University Geological Survey of Kansas› (Vol. IV, Topeka 1898); Williston and Case, ‹Kansas Monasaurs› (in *Kansas University Quarterly*, Vol. I, Lawrence 1892).

**PYX**, anciently any casket and in particular a jewel-case. The present significations of the word are: (1) The vessel, of gold or silver, in which, in Catholic churches, the blessed sacrament is reserved; called also ciborium; and the small silver-gilt vessel in which the host is carried to the sick for administration at their homes. In former times the pyx had the form of a dove and was suspended above the altar; in present usage it is reserved in the tabernacle or shrine above the high altar. (2) The box or chest in which, at the English mint, specimens of the coinage are deposited, to be tested by a jury of goldsmiths about once in three years; this test is called the «trial of the pyx.»

**PYXIE.** The pyxie, or flowering moss (*Pyxidanthera barbulata*), is one of the most beautiful and early-flowering plants of the moist, sandy, pine-barren regions of New Jersey and North Carolina. It is found only in certain localities even in this restricted district, but is abundant in its chosen haunts, blooming in April. The pyxie belongs to the *Diapensia* family, very closely related to the heather tribe, and is a small, evergreen, shrubby plant, lying, cushion-like, flat on the sand, and having long, tapering branches trailing in all directions. The small, rigid, pointed leaves are tinged with red at blossoming time and are very numerous, but are nearly hidden by the profusion of waxen, symmetrical, five-lobed flowers, coral-tinted in the bud, creamy white when open. The twin anther-cells of the five anthers are globose and transversely valved, whence the Greek generic name, meaning box-anther.



PYTHON (*Python molurus*)

# Q

Q the 17th letter of the English, Latin and other alphabets of western Europe. As in Latin so in English it is always followed by the vowel *u:* as in English so probably in ancient Latin *qu* was equal to *cu* or *kw: q* is, therefore, a superflous letter, and has no place in a scientific alphabet, save as standing for some sound differing from that of *k*: in A. J. Ellis's palæotype alphabet *q* stands for nasal *ng.* Some of the ancient Latin grammarians regarded Q as a contracted form of CV (that is *cu*); but others, and with them modern philologists, recognize in Q a modified form of the koppa of early Greek Ϙ, derived fro mthe Phœnician alphabet. (See ALPHABET). This character occurs in very ancient Latin inscriptions; but later the down stroke was written aslant, Q, whence the form Q. Q was not employed in Anglo-Saxon writing, *cw* being used instead: *cwēn,* queen; *cwellan,* to quell; nor was it used in early German writing, except for words borrowed from Latin; but afterward words of native Germanic origin were spelled with *q*: *quälen,* to torment; *quer,* athwart.

In some systems for the transliteration of the semitic languages Q is used for the Hebrew ק, Arabic ق. The sound Qu in Germanic languages is cognate with what appears to be an unlabialized guttural in the mother tongue of the Indo-Europeans. The labialized guttural Q is often related to pure labial sounds: thus the Latin *quattuor,* «form,» corresponds to the Oscan *petora.* In words borrowed from the French, such as *coquette,* Qu is pronounced as a simple *k. Q* stands for «Quintus,» Q. E. D. for Lat. *quod erat demonstrandum,* «which was to be proved»; Q. E. F. for *quod erat faciendum,* «which was to be done»; qr. for «quire» or «quarter»; qt. for «quart»; q.v. for Lat. *quod vide,* «which see»; q.d. for Lat. *quasi dictum,* «as if said»; Q. C. for «Queen's Counsel.»

**QUA** (kwä) **BIRD.** See HERONS.

**QUACKENBOS,** kwăk'ĕn-bŏs, **George Payn,** American educator: b. New York, 4 Sept. 1826; d. New London, N. H., 24 July 1881. He was graduated at Columbia in 1843 and admitted to the bar. Later he abandoned law and for many years conducted a large private school in New York. He published ‹Advanced Course of Rhetoric and Composition› (1854); ‹School History of the United States› (1857); ‹Natural Philosophy› (1859), and many other once popular textbooks.

**QUACKENBOS, John Duncan,** American physician, son of G. P. Quackenbos (q.v.): b. New York, 22 April 1848. He was graduated from Columbia in 1866 and from the College of Physicians and Surgeons in 1871, and has since practised in New York. He became adjunct professor of English at Columbia in 1884, and was professor of rhetoric in Barnard College 1891–93. He is a specialist in mental diseases and has published, among various other works, ‹History of the World›; ‹History of Ancient Literature›; ‹Tuberculosis›; ‹Typhoid Fever›; ‹New England Roads and Roadside Attractions›; ‹Hypnotism in Mental and Moral Culture›; ‹Hypnotic Therapeutics›; ‹Enemies and Evidences of Christianity›; ‹Magnhild› (1919), etc.

**QUACKENBUSH,** kwăk ĕn bush, **Stephen Platt,** American naval officer: b. Albany, N. Y., 23 Jan. 1823; d. Washington, D. C., 4 Feb. 1890. He entered the navy as midshipman in 1840, received rank as lieutenant in 1855 and lieutenant-commander in 1862. In the early part of the Civil War he had charge of the *Delaware, Unadilla, Pequot, Patapsco* and *Mingo* in the blockading squadron, covered General Burnside's army at Aquia Creek and Roanoke Island, participated in the battles of Elizabeth City and New Berne, N. C., engaged the Confederate batteries at Winton, N. C., and destroyed the town. He later took part in the engagements at Sewell's Point Landing, Wilcox Landing and Malvern Hill and received at the last-mentioned place a wound from which he lost his right leg. In 1863 he captured the *Princess Royal* loaded with materials for a Confederate ironclad. In 1864 while dredging Charleston Harbor for torpedoes his ship, the *Patapsco,* was struck by a torpedo and sunk. Later he was in command of the *Mingo,* protecting Georgetown, S. C. He became rear-admiral in 1884 and was retired in 1885.

**QUADI,** kwā'dī, an ancient powerful people of southeastern Germany, of the Suevic race. They inhabited the country bounded by Mount Gabreta, the Hercynian forest, the Sarmatian Mountains and the Danube; their neighbors being the Gothini and Osi on the north, the Jazyges Metanastæ on the east, the Pannonians on the south and the Marcomanni on the west. With the last-named people they were on terms of alliance. In the reign of Tiberius the Romans erected a kingdom of the Quadi; but in the reign of Marcus Aurelius the Quadi joined the great German confederacy against the empire, and in 174 were on the point of destroying the imperial legions in a great battle when a sudden storm, attributed to the prayers of the Christian soldiers in the emperor's army, enabled the Romans to recover from their confusion and achieve a complete victory. The independence of the Quadi was recognized by Commodus in 180. They disappear from history about the close of the 4th century.

**QUADRAGESIMA,** the period of the 40 days' fast preceding Easter: the season has a like name in Greek, *Tesserakosté,* fortieth. The first Sunday of Lent is sometimes called Quadragesima, but in the Roman calendar it is *Dominica prima Quadragesimæ,* first Sunday of Lent and the Sundays following are denominated, respectively, the second, third and fourth of Quadragesima, Passion Sunday (*Dominica Passionis*), and Palm Sunday (*Dominica Palmarum*). In the Book of Common Prayer these six Sundays are called the first, second, third, fourth and fifth of Lent and «Sunday next before Easter»; but this Sunday is also styled in England and the United States «Passion Sunday,» and its week «Passion Week»; its familiar name among Catholics is «Holy Week.»

**QUADRANGLE,** a square or four-sided court or space surrounded by buildings, as often seen in the buildings of a college. Also in geometry, a figure having four angles, and consequently four sides.

**QUADRANT.** See SURVEYING.

**QUADRATE BONE,** the squarish bone developed in reptiles and birds, by means of which the lower jaw is articulated or joined to the skull. The lower jaw of these forms is thus not articulated directly or of itself to the skull, as in mammals; and in reptiles and birds each half of the lower jaw is composed of a number of distinct pieces. In mammals, on the contrary, the lower jaw consists simply of two halves united together in front. The *os quadratum,* or quadrate bone, which thus forms a characteristic structure of birds and reptiles, is generally regarded as corresponding in mammals to one of the little bones or auditory ossicles of the internal ear, named the malleus. See EAR.

**QUADRATURE OF THE CIRCLE.** The problem involved in the quadrature of the circle requires the determination of the length of a straight line such that the square constructed thereon shall have an area equal to that of a given circle. It can be shown in a variety of ways that, if $r$ is the radius of the circle, the area will be equal to $\pi r^2$ where $\pi$ can only be obtained approximately in terms of a finite number of fractions. On the other hand, it has become a matter of general information that the quadrature of the circle is impossible, and this is true only when the ancient Greek problem is understood, which involves a serious limitation; that is, the quadrature must be effected by means of a geometrical construction in which the mathematician is limited to the use of but two instruments, the straight edge and a pair of compasses. The problem is not solved, therefore, if any other instrument or any equivalent analytic method is employed. For 4,000 years innumerable attempts have been made to discover this construction, all destined to fail, as it was demonstrated by Lindemann in 1882 to be impossible. In reaching this conclusion we are confronted by the fundamental question: What geometrical constructions are, and what are not, possible, when restricted to the use of these instruments? In analysis, operations correspond to constructions. The operation, $a \times b$, involves taking $b$ units $a$ times, which, with an assumed unit of length, is equivalent to laying off a line having $a \times b$ units of length, which is accomplished by using the method of proportions. In a similar manner, the *rational* operations of addition, subtraction, multiplication and division find a geometrical solution involving the straight edge alone.

Irrational operations are divided into algebraic and transcendental. Any operation that involves the extraction of a square root only presents the simplest case of an algebraic irrationality, and any construction involving the determination of the points of intersection of two circles, or a circle and straight line, leads to an equation of the second, of the fourth or of some higher degree, whose solution involves the extraction of square roots and rational operations only. Conversely, the necessary and sufficient condition that unknown quantities can be constructed with the straight edge and compasses is that the unknown quantities can be expressed explicitly in terms of the known by an analytic expression involving only a finite number of rational operations and square roots. In other words a Euclidean geometrical solution is impossible when no corresponding algebraic equation exists. When a number like $\sqrt{2}$ is the root of an algebraic equation with integral coefficients, for example, $x^2 - 2 = 0$, and still can not be expressed exactly in terms of a finite series of numbers it is an algebraic irrational number. When the number, like $e$, the natural base in the theory of logarithms, or $\pi$, the ratio of the circumference to the diameter, is not the root of any algebraic equation, with integral coefficients, it is a transcendental number. Lindemann provided that $\pi$ is a transcendental number and, hence, since it is not the root of any algebraic equation, it cannot be constructed to an assumed unit by the extraction of square roots, that is, by using the straight edge and compasses.

The possiblity of a geometrical solution of a problem in general depends upon a theorem in the theory of numbers to the effect that *the degree of the irreducible equation satisfied by an expression composed of square roots only is always a power of 2*; whence, *if an irreducible equation is not of degree $2^n$, it cannot be solved by square roots.*

Next to the squaring of the circle, the most famous problems of antiquity are the *Delium problem* of the *duplication of the cube* and the *trisection of an arbitrary angle.* Granting the preceding general theorem, these are easily shown to be impossible when restricted to the straight edge and compass.

The duplication of the cube requires the determination of the edge of a cube $x$, such that its cube shall be twice the volume of a given unit. That is $x^3 = 2$. This equation is irreducible, since otherwise $\sqrt[3]{2}$ would be rational. Moreover, the equation is a cubic and its degree is not of the form $2^n$. Hence the solution is in general impossible.

The problem of the trisection of an arbitrary angle corresponds to the solution of

$$x^3 = \cos \phi + \sqrt{-1} \sin \phi$$

and it follows that in general this is impossible by Euclidean methods.

**History.**— The quadrature of the circle is attempted in the Rhind Papyrus (2000 B.C.), the oldest known mathematical work, in which Ahmes, an Egyptian priest, lays down the empirical rule: «Cut off one ninth of the diameter;

the square on the remainder will equal the area of the circle.» This rule affords $\pi = \left(\frac{16}{9}\right)^2 =$ 3.16 . . . . . , a value reasonably accurate as compared with $\pi = 3$, the value assumed in the Bible (1 Kings vii, 23; Chronicles iv, 2). Archimedes (200 B.C.) invented the method still used by students of plane geometry that depends on inscribing and circumscribing regular polygons, which, save for an improvement by Huygens (1654), remained in use until the invention of the infinitesimal calculus by Newton and Leibnitz in the last quarter of the 17th century. Hippocrates of Chios (470 B.C.) was the first to investigate areas bounded by curves and to bring into prominence the problems of squaring the circle and duplication of the cube. According to Philoponus, the Athenians were suffering from a severe plague of typhoid fever in 430 B.C., and were told by the oracle at Delos that Apollo required an altar in the form of a cube twice the size of the one existing. A new one was, therefore, constructed, having each edge twice the length of the old one, but the plague was worse than ever. Suspecting some mystery, confirmed by the insistence of the oracle, the Greeks applied to Plato, the most illustrious of their geometricians, and were referred by him to Hippocrates. He succeeded in reducing the problem to the determination of two mean proportionals: for, if $a : x = x : y : = y : 2a$, then $x^2 = ay$ and $y^2 = 2ax$, the equations of two parabolas, which intersect in a point whose abscissa is $x^3 = 2a^3$. This is equivalent to a graphical solution by means of conics, but to draw the curves, a different instrument would be required than those prescribed by Euclid. The problem was thereafter known as the Delian problem. The *Cissoid of Diocles* (150 B.C.) and the *Conchoid of Nicomedes* (150 B.C.) are curves of the third and fourth degree, respectively, invented for the special purpose of duplicating the cube and trisecting any angle. The curve known as the *quadratrix of Dinostratus* (350 B.C.) which, however, had previously been constructed by Hippias of Elis (420 B.C.) for the trisection of the angle, sufficed also to determine the length of a circular arc and for the quadrature of the circle. It belongs to the class known in modern times as *integral curves*, since the ordinate can be expressed as an integral, such a curve being known to the ancients as a *quadratrix*. If OA and OB are two perpendicular radii of a circle and two points M and L move with constant velocity one upon the radius OB and the other upon arc AB, such that starting from O and A at the same time they both arrive simultaneously at B; then the intersection of OL and MP drawn parallel to OA is a point on the quadratrix. The ordinate, $y$, is proportional to $\theta$, the angle between OL and OA, and since $y = 1$, when $\theta = \frac{\pi}{2}$, $\theta = \frac{\pi}{2} y$. But $\theta = \tan^{-1}\frac{y}{x}$, the equation of the quadratrix becomes $\frac{y}{x} = \tan \frac{\pi}{2} y$.

It cuts the axes of X at the point whose abscissa is $x = \underset{y=0}{\text{Limit}} \dfrac{y}{\tan\frac{\pi}{2} y} = \frac{2}{\pi}$.

It follows that the radius of the circle is the mean proportional between the length of the quadrant and the abscissa of the intersection of the curve with the axis of X. Hence any apparatus that will describe the quadratrix will enable us to determine $\pi$ graphically. Evidently the curve $\gamma = \sin n^{-1}x$ is much more convenient for this purpose, since $\pi$ is one of the ordinates of this curve when $x$ equals zero; but this curve does not appear to have been used by the Greeks. It is called the *sinusoid*, the axis being vertical, and any transcendental apparatus which will trace the sinusoid by continuous motion would afford a geometrical construction of $\pi$. Such an apparatus has been invented recently by a Russian engineer, Abdank-Abakanowicz, and constructed by Coradi of Zürich. It is called the integraph, and with its aid it is possible not only to lay off $\pi$ but to trace the *integral curve*.

$Y = F(x) = \int f(x)\,dx$, when the *differential curve* $y = f(x)$ is given.

The rise of modern analysis after Newton and Leibnitz developed many new methods for the evolution of $\pi$, the best known being the so-called series of Leibnitz,

$$\pi = 1 - \tfrac{1}{3} + \tfrac{1}{5} - \tfrac{1}{7} + \ldots$$

After the invention of logarithms by Napier (1614), Euler, by the introduction of complex quantities, developed the celebrated relation between the Naperian base $e$ and $\pi$,

$$e^{ix} = \cos x + i \sin x$$

which for $x = \pi$ reduces to the most remarkable relation in mathematics,

$$e^{i\pi} = -1.$$

The modern proofs of the transcendency of $\pi$ are based upon this relation, since they all depend upon that of $e$. In 1873 Hermite ('Sur la Function exponentielle,' *Comptes rendus*, 1873) first proved the transcendence of $e$, and this was followed, in 1882, by an analogous demonstration for $\pi$, given by Lindemann ('Über die Zahl $\pi$,' *Mathematische Annalen*, XX 1882). This demonstration is equivalent to proving that the Euclidean problem of the quadrature of the circle is impossible, and closes in this generation a question that has occupied mathematicians for 4,000 years. The long and difficult proofs of Hermite and Lindemann have been much simplified, first by Weierstrass (*Berliner Berichte*, 1885), and in particular by Hilbert, Hurwitz and Gordon (*Mathematische Annalen*, Vol. XLIII). The questions involved treated without requiring a knowledge of the calculus have become familiar to English mathematicians through the translation by Beman and Smith of Klein's 'Famous Problems of Elementary Geometry' (1897). Consult also the chapter on 'The History and Transcendence of $\pi$, in 'Monographs on Topics in Modern Mathematics' (New York 1911), by D. E. Smith.

J. BRACE CHITTENDEN, PH.D.

**QUADRIENNIUM UTILE**, kwäd-rĭ-ĕn'-ĭ-ŭm ū-tĭ-lā (Latin, meaning «four years useful»), a phrase in Scotch law, referring to the four years after majority, during which period a person may set aside or revoke any deed executed during his minority, if such deed is to his prejudice. The same law existed among the Romans, to protect the rights of minors by giving them, after majority, an opportunity to revoke any deed which had been made to their disadvantage when they were inexperienced minors or, in the eyes of the law, infants.

**QUADRIGA.** See Chariot.

**QUADRILATERAL,** a common name for the four fortresses of northern Italy: Mantua, Legnago, Peschiera and Verona, which form an outwork to the bastion of the mountains of the Tyrol. They have figured prominently in the wars between Austria and the several Italian states. There exists also a combination of four fortresses in Poland called the Polish Quadrilateral.

**QUADRILATERAL.** See Polygon.

**QUADRILLE,** kwäd-rĭl, or kă-drĭl', (1) a dance of French origin, now forgotten in most civilized countries of the globe, which consists generally of five consecutive figures or dance movements, danced by four couples, each forming the side of a square; or by four sets (often pairs) of couples. (2) Also an obsolete game of cards played by four persons. The game is celebrated by Pope in ‘The Rape of the Lock.’

**QUADRIVIUM,** the name given in the Middle Ages to the four mathematical branches of study, arithmetic, music, geometry and astronomy, in contradistinction to the Trivium, which consisted of the three remaining branches taught in the mediæval schools, and which consisted of grammar, rhetoric and dialectics, the whole comprehending what was called the seven liberal arts. This program of study was outlined by Plato in the ‘Republic.’

**QUADROON,** or **QUARTEROON,** a person of mixed blood, usually one who is one-quarter negro and three-quarters white; that is, one of whose grandparents was white and the other negro, and one of whose immediate parents was white and the other mulatto.

**QUADRUMANA,** the name applied by Cuvier and others to denote the order of «four-handed» mammalia represented by the lemurs, monkeys and apes, from the fact that these forms agree in possessing a great toe so constructed as to be capable of opposing the other digits of the feet, instead of being placed parallel with the other toes, thus forming a kind of «hand» adapted for supporting the foot on the ground. Cuvier separated man as a collateral order *Bimana* or «two-handed» mammalia. But in modern zoology, man is included in one order with the apes and monkeys — the order *Primates* (q.v.).

**QUADRUPLE ALLIANCE,** a union of four sovereigns or states to forward their common policies. Notable among such unions was the alliance between Great Britain, France and the German Empire, concluded at London in 1718, in which Holland joined 1719; its objects were to secure to the house of Hanover the succession to the British Crown; to secure France to the house of Bourbon; and to prevent the union of France and Spain under one crown. Another memorable quadruple alliance was that of Austria, Russia, Great Britain and Prussia, formed in 1814 to regulate the political system of Europe after the fall of Napoleon. In 1834 England, France, Spain and Portugal entered into an alliance to put down Don Carlos and his partisans.

**QUADRUPLEX TELEGRAPHY.** See Electrical Terms.

**QUÆSTOR,** kwĕs'tôr, the title of a class of magistrates in ancient Rome who had charge of the pecuniary affairs of the commonwealth: they were the treasurers of state. Of these one, *quæstor urbanus* or *q. ærarii* (urban quæstor, quæstor of the treasury), who remained at Rome, administered the public revenues and expenditures. Other quæstors, called provincial or military quæstors, served as assistants to the proconsuls or proprætors who governed the several provinces: their duty was to provide for the payment and provisioning of the troops, to collect the imposts and, in the absence of the governor, to act in his stead. In very early times there was in Rome an official styled *quæstor parricidii* (tracker of murder) who prosecuted persons charged with capital offenses. A quæstor was ex officio entitled to a seat in the Senate.

**QUAGGA,** kwăg'ạ, a species of the horse (*Equus quagga*), nearly allied to the zebras, formerly found on the plains of southern Africa, but now quite extinct. It was striped like the zebra, but did not possess bands on the limbs. The color was dark brown on the head, neck and shoulders, the back and hind quarters being lighter, while the croup was russet gray. The under parts of the body were white, the upper parts of the legs and tail being marked by whitish bars. The quagga was smaller than the zebra, and bore a closer resemblance to the horse. The ears were short, the head being relatively small. The tail was tufted. These animals were gregarious, the herds which inhabited the Kaffrarian plains numbering each several hundreds of individuals, which would mingle with the zebra herds. The quagga was active, nimble and elegant in its movements. The Bushmen and Kaffirs esteemed the flesh as good palatable food, and these animals were on the same account unremittingly pursued by the lion. It was tamed without much difficulty, but domestication apparently altered its disposition and rendered it dull and less active in habits. The Dutch colonists were said to be in the habit of keeping quaggas along with their cattle which the quaggas defended from the attack of hyænas and other carnivora by trampling on the invaders and otherwise injuring them. The quagga bred with the common horse, and a mixed race of this kind, possessing great beauty of form, and retaining in a large degree the characteristic markings of the quagga, is said to have existed in England at one time. The name «quagga» was derived from the cry of the animal, which may most nearly be expressed by the word *Coua-ag*. The animal has received a variety of names from authors: thus Pennant terms it the *quacha*, and Masson the *opeagha*. Consult Bryden, ‘Nature and Sport in South Africa’ (1897), and early writers on South Africa, especially Harris, Lichtenstein and Gordon-Cumming.

**QUAGLIO,** kwa'lē-ō, name of a family of painters, originally belonging to Laino, Lago Maggiore, Italy, but afterward dwellers in Munich. The most eminent among them, Domenico (b. Munich, 1 Jan. 1786; d. Hohenschwangau, 9 April 1837), was for 11 years decorative painter for the Munich Theatre. He subsequently turned his attention to oil-painting and also executed etchings and lithographs. He traveled through Germany, along the Rhine, to the Netherlands, to France, Switzerland and Italy, with the object of studying mediæval architecture as a subject for painting. During the latter period of his life he was engaged by the Crown Prince Maximilian of Bavaria in the restoration and decoration of the castle of Hohenschwangau. He was member of the Academy of Munich and Berlin and one of the first German artists to produce in painting architectural effects of a thoroughly artistic quality. He also published books on the mediæval buildings of Bavaria; on the most noteworthy buildings of Munich, and on the architectural statuary of Bavarian mediæval buildings. His brother, LORENZ QUAGLIO (b. Munich, 19 Dec. 1793; d. there, 15 March 1869), directed his studies to genre painting and lithography. In this latter department of art he reached the highest excellence. His paintings consist of incidents from mediæval life and his landscapes are taken from the highlands of Bavaria. The third brother, SIMON QUAGLIO (b. Munich, 23 Oct. 1795; d. there, 8 March 1878), was scene painter and decorator to the Hof Theatre and executed many exceedingly clever pictures in oil, chiefly of architectural subjects and distinguished for faultless perspective, beauty of design and brilliancy of coloring. ANGELO, son of the last (b. Munich, 13 Dec. 1829; d. there, 5 Jan. 1890), was scene painter to the Bavarian Hof Theatre and by his architectural decorations gained a world-wide reputation.

**QUAHA,** the side-striped African jackal (*Canis lateralis*). See JACKAL.

**QUAHOG,** or **ROUND CLAM.** See CLAM.

**QUAI D'ORSAY,** kā dŏr-sā. See PARIS.

**QUAIL,** one of several partridges (q.v.); in the eastern United States the bob-white (*Colinus virginianus*) and on the Pacific Coast partridges of other genera. The eastern bob-white requires no description beyond a statement of the differences between the sexes. Besides being larger, the male has the superciliary line and throat pure white, these parts in the female being buff and without black borders and she also has the colors generally more blended. The bob-white is widely distributed throughout the eastern United States; on the Atlantic Coast it barely enters Maine, farther west it is found northward in New York, Ontario and Minnesota; southward it is abundant in the Gulf and South Atlantic States and westward reaches to the elevated central plains from South Dakota to Texas. Farther westward at many points in this country, in Jamaica and other West Indian islands this species has been very successfully introduced, but similar attempts in Europe seem to have failed. The Florida and Texan birds present extremes of variation recognized as sub-species and a related species (*C. ridgwayi*) occurs in Arizona. Although in New England and elsewhere called «quail» and in the Middle and Southern States very generally «partridge,» neither of these names is, properly speaking, correct. The «bob-white» of the farmer's boy is a far more characteristic and appropriate name. Like related species it is gregarious, but the coveys consist of members of one family — a pair of old birds and their numerous progeny of one or two broods — which remain in company until the next pairing season. They live where thickets, woodland borders or fence rows offer suitable cover. Throughout most of the year they feed upon berries, seeds and mast and frequent grain-fields after harvest to glean the fallen seeds. Occasionally they attack fields of buckwheat, of which they are very fond, but the slight damage thus done is repaid manyfold in the destruction of grasshoppers and other insects in the late summer and autumn. Most of their life is spent on the ground, on which they scratch like hens. When whistling or sometimes when alarmed they will perch upon trees or fences, but usually run to a cover, where they remain perfectly motionless or spring suddenly into the air with a loud whirr and fly swiftly straight away to a thicket. At night they commonly huddle together in a close bunch with heads outward in the concealment of a bush, but may occasionally roost on trees. The call is a clear loud whistle of two or three notes, variously interpreted as «ah, bob-white,» «buckwheat» and «no buckwheat» or «more wet» and «no more wet.»

Being non-migratory, the bob-white is frequently exposed to privation during the winter. During a heavy snow-storm the members of a covey will often huddle together to keep warm and allow themselves to become completely covered and should a crust form on the surface many will sometimes perish miserably. In April and May they construct simple nests of coarse grass stems, usually arched over at the top, in a depression on the ground under the shelter of a bush or tuft of grass. The many eggs are pure white and top-shaped and arranged with the pointed ends downward. The young run immediately after hatching and are wonderfully interesting and pretty creatures with a marvelous skill for concealing themselves when alarmed. Sometimes a second brood is raised in August. When this is the case the male takes sole charge of the first until the second is hatched, when both parents join the combined broods; thus are formed the largest coveys.

The bob-white combines all of those qualities which a sportsman seeks in an ideal game bird and it is, without question, the most sought and most generally appreciated by gunners of any game bird in this country. Every condition unites to make the sport exhilarating and healthful, to test the skill of the sportsman and to please his appetite at the close of his labors. In most States this perfect game bird is now rigidly protected by laws prohibiting snaring, netting and trapping, by the enactment of a close season covering the breeding period and continuing until the young birds are strong of wing, or by other measures designed to meet local conditions or abuses. In several States at present the shooting of quail is prohibited for five or more years. Although the bird is so prolific it has numerous natural enemies, especially hawks, weasels, skunks, cats, etc., which check its increase. When to this natural loss is added the enormous number annually sacrificed to the deservedly popular sport of quail-shooting, the necessity of legal protection becomes manifest. The nature and method of the sport differs so much with the varied actions of the birds due to season, locality, character of ground, etc., and to the local and personal idiosyncrasies of gunners, that the reader must be referred to some of the numerous sporting books for details. The general method is to hunt singly or in couples, with one or two dogs, which quarter the ground under the guidance of signs and whistled signals from the sportsman. When the birds flush they spring up suddenly and immediately attain full speed, which keeps the gunners always on the *qui vive*. Either pointers or setters may be used according to the character of the ground and the personal preference of the sportsman. By many the Llewellyn setter is considered to be the most perfect dog for rapid quartering of the ground and general adaptation to this class of sport. As to guns, tastes differ, but a hammerless arm of moderate weight, long range and 12 or 14 bore has the preference of experts.

These birds have been successfully bred in captivity, as is explained in the article GAME-BREEDING.

Consult books mentioned under BIRDS and publications of the United States Biological Survey, especially Bulletin 21, Judd, ‹Bob-white and Other Quails . . . in their Economic Relations› (Washington 1905).

**QUAIN, kwān, Jones,** English physician: b. Mallow, Ireland, 1796; d. London, 27 Jan. 1865. He studied medicine at Dublin and Paris and was professor of anatomy and physiology at London University 1831–36. He was the author of Quinn's ‹Elements of Anatomy› (1828; 10th ed., 1890), and published also a series of ‹Anatomical Plates› (1858) and a translation of Martinet's ‹Pathology› (1835).

**QUAIN, Richard,** English anatomist, brother of J. Quain (q.v.): b. Fermoy, Ireland, July 1800; d. London, 14 Sept. 1887. He was appointed professor of anatomy and clinical surgery in University College, London, in 1837, and was elected president of the Royal College of Surgeons in 1868. Among his works are ‹Anatomy of Arteries,› with folio plates (1845); ‹Diseases of the Rectum› (1854); ‹Observations on Medical Education› (1865); ‹Some Defects of Medical Education› (1870). He bequeathed nearly $375,000 to University College, London, for the «education in modern languages (especially English) and in natural science.»

**QUAIN, SIR Richard,** English physician, cousin of J. and R. Quain (q.v.): b. Mallow, County Cork, 30 Oct. 1816; d. London, 13 March 1898. He studied medicine in University College, London, whence he was graduated in 1842. He was elected a member of the Royal College of Physicians in 1846; in 1871 was chosen a Fellow of the Royal Society and he was president of the General Medical Council from 1891 till his death. He was created a baronet in 1891. His practice in London was large and lucrative and besides publishing several medical treatises he edited a well-known ‹Dictionary of Medicine› (1882; new ed., 1894).

**QUAKER CITY,** a popular nickname applied to Philadelphia, which was planned and colonized by William Penn and other members of the Society of Friends.

**QUAKER HILL, Battle of,** in the American Revolution, a notable battle fought 29 Aug. 1778. On the previous night, the 28th, the Americans on Rhode Island fell back toward Butts Hill at the northern end of the island. Contrary to Greene's advice the enemy was allowed to occupy Quaker and Turkey Hills. From these hills the British assailed the Americans, but were repulsed and driven back to Turkey Hill. The hottest of the battle took place on the low ground between the hills. The American loss in killed and wounded was 206; that of the British 222.

**QUAKER POET, The,** a name often applied to John Greenleaf Whittier, and long before his day bestowed upon the English poet, Bernard Barton (q.v.).

**QUAKERS.** See FRIENDS, RELIGIOUS SOCIETY OF.

**QUAKERTOWN,** Pa., borough in Bucks County, 38 miles north of Philadelphia, on the Philadelphia and Reading and on the Quakertown and Delaware River railroads. It manufactures cigars, harness and stoves and has silk mills. Pop. 3,801.

**QUALIFICATIONS FOR OFFICE.** See ELECTORAL QUALIFICATIONS.

**QUALIFICATIONS OF VOTERS.** See ELECTORAL QUALIFICATIONS; WOMAN SUFFRAGE; ELECTIONS; NATURALIZATION; VOTES, VOTERS, VOTING.

**QUALITY,** in the language of logicians, is used to designate the nature of propositions as affirmative or negative: the proposition «gold is a yellow substance» is of affirmative quality; «gold is not easily fusible» is a proposition of negative quality. In metaphysics quality is either primary or secondary; primary qualities are those which are essential to the existence, or even the conception of the thing; secondary qualities are those not essential to such conception; whether primary or secondary, a quality is that which makes, or helps to make, anything such as it is. An essential quality is that which may not be separated from a substance or an individual without taking it out of its class. On the other hand an accidental quality may be detracted from a substance or individual without a change of classification.

**QUANA, Parker,** Comanche chief: b. about 1845; d. 1911; the most influential leader among the three confederated tribes of Kiowa, Comanche and Apache in southwestern Oklahoma. He was the son of Nokoni, the principal chief of the Comanche, and Cynthia Parker, a white captive. Quana became prominent in 1874, when he acted as leader of the band of 700 picked warriors from the confederated tribes in an attack on the South Canadian River fort, Adobe Walls. He was active in the Indian uprising of the following year and was the last to surrender when peace was ultimately made. His superior intelligence, however, induced him to acquire white habits and customs, and after some time spent in Texas, he became thoroughly convinced of the benefits of civilized life. On his return to his tribe he endeavored to persuade them to adopt his views. In 1882 he proposed leasing the surplus pasture lands of the reservation, a measure which increased the income of the tribes by $100,000 yearly. In 1888 he was appointed a judge of the Indian Court, and in 1892 was the first signer of the treaty which opened the reservation lands to settlers in 1901. Parker Quana did much to civilize the Indian tribes under his leadership. He was himself a man of keen intelligence and a linguist, speaking several Indian dialects and English and Spanish. He recognized that the only salvation for the Indian was to be found in education and the adoption of the ways of civilization. He established schools for the Indians and all his children were well educated. Two at least of his daughters married white men. After the division of the Indian lands, Parker Quana lived in a large modern house surrounded by a well-cultivated ranch. For considerably over a quarter of a century he was the most prominent member of the three allied tribes, Kiowa, Comanche and Apache, practically all of whose tribal business was in his hands. In this capacity he made several visits to Washington, where he always had the consideration of the government. He also traveled extensively throughout the United States and made a careful study of agricultural methods and of the ways of living among the whites, which he copied and taught to his people by example and precept. It was through his earnest and persistent efforts that the Indians of his tribes secured rights of citizenship.

**QUANAH,** Tex., city and county-seat of Hardeman County, 200 miles northwest of Dallas, on the Fort Worth and Denver City, the Saint Louis and San Francisco and the Quanah, Acme and Pacific railroads. Irrigation is carried on to a considerable extent in the vicinity, the crops being chiefly cotton, corn and wheat. Manufacturing includes flour, cement, cottonseed oil and cottonseed feed products. The town is growing in size. Pop. 3,691.

**QUANTIFICATION OF THE PREDICATE,** supplying to the predicate in a logical proposition a word, as «some,» or «all,» or «no,» etc., to indicate whether the whole of it or only a part agrees with or differs from the subject. In the proposition «all metals are elements» the subject «metals» is quantified by the use of «all»; but the predicate is not quantified, and in form the proposition does not distinctly assert whether metals constitute the whole list of elements or not. But by inserting «some» before the predicate, «elements» is quantified — «all metals are some elements.» It was assumed by Aristotle and was maintained by all logicians after him till Ploucquet and Lambert in the 18th century and Sir William Hamilton in the 19th, that the predicate of all affirmative propositions is «undistributed» (not taken in its universal comprehension), while the predicate of a negative proposition is always distributed. But after Sir William Hamilton had given notoriety to the doctrine of quantification, this was seen to be an error, through which an infinite number of affirmative propositions which are universal in both terms are excluded from the system of formal logic. Among the numerous changes in the theory of formal logic which follows from the adoption of the quantified predicate the most important are the reduction of the conversion of propositions from three species to one, reduction of all the general laws of categorical syllogisms to a single canon, and the abrogation of all the special laws of syllogism. But the doctrine of the quantification of the predicate has never been generally adopted in the exposition of formal logic, on the ground that there is no proposition that cannot be dealt with under the Aristotelian forms, and that quantification does not really simplify the theory of logic. At present both the old Aristotelian-formed logic and the logic of quantification have been supplanted by the symbolic logic. See LOGIC, SYMBOLIC.

**QUANTITY,** in the language of *Mathematics,* is whatever can be measured: space, time, weight, number, force, etc., are quantities. Quantities are represented in mathematics by symbols, and these too are called quantities. In algebra quantities are distinguished as known and unknown, real and imaginary, constant and variable, rational and irrational. For the meaning of these terms, see ALGEBRA, DEFINITIONS AND FUNDAMENTAL CONCEPTS; VARIABLE QUANTITIES. A simple quantity is expressed by a single term, as *a* or *b;* a compound quantity is one expressed by two or more terms connected by the sign of plus (+) or minus (—). Quantities having the plus sign prefixed are called positive or affirmative; those with the minus sign prefixed are called negative quantities. Similar quantities are such as consist of the same letters, and the same powers of the letters, as *abc,* —2*abc,* +4*abc,* etc. In *Logic,* quantity is the extent to which the predicate in a proposition is asserted of the subject: when the predicate is affirmed of the whole of the subject the proposition is a universal one, as in the example «all metals are elements»: but when the predicate is affirmed only of a part of the subject, as in «some metals are brittle,» the proposition is called a particular one. See OPPOSITION. In *Grammar* and *Prosody,* quantity is the measure of a syllable, or the time in which it is pronounced. In *Music,* quantity is the relative duration of a tone.

**QUANTRELL, William,** American guerrilla: d. Kentucky, 1864. His depredations first became widely known when he raided Lawrence, Kan., destroying 185 buildings, killing 140 inhabitants and leaving the town completely devastated. His operations were then continued through western Missouri and eastern Kansas, but upon his extending his ravages to Kentucky in 1864 he was outwitted and killed.

**QUANZA,** a river of Africa. See KWANZA.

**QUAPAW** (kwä'pạ) **INDIANS.** See SIOUAN.

**QUAQUAVERSAL FOLD.** See FOLDS.

**QUARANTINE,** a stated period (formerly 40 days) during which a ship coming from a port suspected of contagion, or having a contagious sickness on board, is forbidden intercourse with the place at which it arrives. Quarantine was first introduced at Venice in the 14th century, is now required in almost every important country except Great Britain. In the United States quarantine enactments were passed by the colonial legislatures and afterward for many years by the States. The first national quarantine act was passed 23 Feb. 1799, requiring Federal officers to aid in the execution of State or municipal quarantine regulations. On 29 April 1878, a national quarantine act was passed. On 3 March 1883, $100,000 was appropriated for maintaining quarantine points along the coast. On 1 Sept. 1892, owing to the presence of cholera, President Harrison proclaimed a 20 days' quarantine of New York. By law it is made a misdemeanor punishable by fine or imprisonment, or both, for the master, pilot or owner of any vessel entering a port of the United States in violation of the act, or regulations framed under it. During the period of quarantine, all the goods, clothing, etc., that might be supposed capable of retaining infection are subjected to a process of disinfection, which is a most important part of the quarantine system.

From 7 Nov. 1896, the system of quarantine ceased to exist in Great Britain, so far as regards the British Islands. The Quarantine Act of 1825 required that quarantine should be imposed on all vessels coming to the British Islands from places from which «the plague or other infectious disease or distemper highly dangerous to the health of his Majesty's subjects» might be brought; but in recent years this act has applied only to the plague and yellow fever, and has not often been used. Vessels arriving from infected places or carrying goods, etc., from such places, were required to be kept at some safe distance from the shore and from other ships — all their passengers and crew being detained on board — until all danger of spreading infection was considered to have passed. Healthy persons were thus exposed to the risk of taking any disease there might be on the ship.

In some places quarantine establishments were maintained for receiving persons from suspected vessels, but most of these were long since abolished, and latterly the only receiving ships were some old hulks at the Motherbank in the Solent. These were maintained by the Privy Council, on whom devolved the administration of the Quarantine Acts. Orders in Council prescribed the system of quarantine. By the Public Health Act of 1875, the defense of the country against cholera was placed in the hands of the Local Government Board, and regulations were issued by that board for the purpose. Instead of quarantining the entire crew of an infected or suspected vessel, the method adopted consisted in the medical inspection of the persons on board, and the separation and detention of those who were suffering from cholera or who were suspected of being infected. All others were permitted to leave the ship, but were traced and watched by the local authorities. Infected articles on board were to be disinfected or destroyed.

Quarantine has long been considered ineffective against the introduction of disease, besides being a source of much danger to those who were compulsorily detained under the system. The sanitary ideas of our day favor the less showy but safer methods long used in England in case of cholera.

In the United States under the law of 28 March 1890, known as the Interstate Quarantine Act, the supervising surgeon-general of the Marine Hospital Service is charged with preparing the rules and regulations, under direction of the Secretary of the Treasury, necessary to prevent the introduction of certain contagious diseases from one State to another, and he has also supervision of the medical inspection of alien immigrants, which under the law of 3 March 1891 is conducted by the medical officers of the Marine Hospital Service. Under the Act of 15 Feb. 1893, he is charged with the framing of regulations for the prevention of the introduction of contagious diseases and the prevention of their spread, and he is also charged with the conduct of the quarantine service of the United States. He has the direction of laboratories established to investigate the cause of contagious diseases, and publishes each week, under the title of ‹Public Health Reports,› sanitary reports received from all parts of the United States and (through the State Department) from all foreign countries. Consult ‹Quarantine in the Maritime Cities of the United States,› New York Acad. of Med. (1913).

**QUARITCH**, kwär'ich, **Bernard**, English bookseller: b. Worbis, Prussian Saxony, 23 April 1819; d. Hampstead, Middlesex, 17 Dec. 1899. In 1839–42 he was employed in a publishing house in Berlin, and in 1846 established himself in London. He was naturalized as a British subject in 1847, and in that year issued his first book catalogue, a single leaf. In 1848 he began issuing a monthly catalogue, which in 1854–64 was printed as a regular periodical under the title ‹The Museum.› His business increased rapidly and he became known as an authority on rare and valuable books of all classes. For 30 years he practically controlled the rare book market, attending in person or by proxy every important book auction in England and America. His catalogues are remarkable productions, the first large one being published under the title ‹Bibliotheca Xylographica, Typographica et Palæographica› (1873) and afterward reissued from time to time with valuable additions, the last complete catalogue being the ‹General Catalogue of Old Books and Manuscripts› (1887–88, index 1892, 7 vols.) and increased by supplements in 1894 and 1897.

**QUARLES**, kwârlz, **Francis**, English poet: b. near Romford, Essex, 1592; d. London, 8 Sept. 1644. He was educated at Cambridge and before 1629 went to Dublin as private secretary to Archbishop Ussher. In 1639 he was appointed chronologer to the city of London and at the opening of the civil wars wrote a work entitled ‹The Loyal Convert.› Of the works of Quarles, in prose and verse, the most celebrated is his ‹Divine Emblems,› a set of designs illustrated by verses. A great part of them are borrowed from the ‹Emblems› of Hermanus Hugo, but the verses are his own. His ‹Enchiridion of Meditations› (1641) is a collection of brief essays and aphorisms, in vigorous and occasionally eloquent language.

**QUARRYING.** Although there are at this time in the United States about 3,000 quarries in operation, with an annual product valued at above $100,000,000, the quarrying industry has not kept pace with modern tendency and progress toward cheaper production. In building operations revolutionary changes have come about in the last few years in the erection of steel buildings and the manufacture of terra cotta and clay products, while quarrying has been, generally speaking, stationary. The natural result of this has been a large increase in the use of the cheaper substitute materials for general bridge and building work, where the natural preference would have been for stone as an ideal and more permanent material, but for its prohibitive cost. As the rapid increase in the use of these other building materials is the direct result of the use of modern methods and machinery to the elimination of hand labor in the greatest degree, it follows that in this direction also lies the continued prosperity of the stone business. As a compromise between the minute subdivisions devised by scientists and the extremely general and often erroneous classification of quarrymen, the following division may be adopted for quarrying operations:

**Limestones and Dolomites.**— The sedimentary and bedded rocks, composed essentially of lime carbonate, or the mixed carbonates of lime and magnesia, the latter receiving the specific title of dolomite. Such have been found to pass into each other by insensible gradations, certain quarries producing at the same time material which, if classed on purely chemical grounds, would be relegated to both divisions. Limestones may also carry a considerable percentage of quartz, when they are called silicious limestones. When clayey, they are called argillaceous limestones.

**Marble.**— Including stones identical in composition with those noted under limestones and dolomites, but which through crystallization and other changes, mainly physical, have come to possess properties rendering them desirable for high-grade building or ornamental work. The marbles of New York, recently brought to light by The Adirondack Lumber and Mineral Corporation, for instance, are largely limestone, while those in Massachusetts, Berkshire County, are largely dolomite. With the marbles are also included a small series of serpentine rocks, which are likewise utilized for decorative purposes.

**Sandstones and Quartzites.**— Rocks composed essentially of sands cemented together with silica or with silica and iron oxide, being made over, as it were, from the detritus of pre-existing rocks. Those classed as *quartzites* are sandstones which have been rendered more or less crystalline through the deposition of silica between the original sand particles, as in the case with the *jasper* of Sioux Falls, South Dakota, or the Potsdam sandstone of Saint Lawrence County, New York. The tuffs and other volcanic fragmental rocks and the bluestones are also here included.

**Silica Sand.**— Silica or silicious sand includes not only sand suitable for the manufacture of glass, but also a large quantity designated as engine and furnace sand. It exists in several States as a sandstone, requiring crushing and screening; as a stone that readily disintegrates when exposed to the action of the elements and needs only washing or burning to reduce the amount of organic matter and other impurities. On account of their use in industry as sand, they are discussed under that title.

**Siliceous Crystalline Rocks.**— Here are included the true granites and syenites, together with trappean rocks, such as are often designated as black granites; the gneisses or so-called striped or bastard granites; the mica schists; and melaphyre, basalt, andesite, syenite, elæolite, diabase, gabbro, norite, lisparite, diorite and other volcanic rocks.

**Slate.**— Including argillaceous rocks, which, through the process of shearing and incidental chemical activity, have undergone a partial metamorphism, resulting in the development of a pronounced tendency to split along certain planes, which may or may not be parallel with the original bedding, into thin sheets suitable for roofing purposes. It is necessarily a consequence that such are restricted to the regions of pronounced earth movements, such as have resulted in the formation of mountain ranges.

The possible resources of the various States of the Union are as follows:

| STATE OR TERRITORY | Present and prospective resources |
|---|---|
| Alabama | Granite, Limestone, Marble, Sandstone, Slate. |
| Arizona | Dolomite, Granite, Onyx, Marble, Sandstone, Trappean Rocks, Volcanic Rocks and Tuffs. |
| Arkansas | Elæolite, Syenite, Granite, Limestone, Marble, Sandstone, Slate. |
| California | Granite, Limestone, Marble, Sandstone, Slate, Trappean Rocks, Verd-Antique Marble, Volcanic Rocks and Tuffs. |
| Colorado | Granite, Limestone, Marble, Quartzite, Sandstone, Trappean Rocks, Volcanic Rocks and Tuffs. |
| Connecticut | Diabase, Gneiss, Granite, Limestone, Marble, Sandstone, Verd-Antique Marble. |
| Delaware | Gabbro, Gneiss, Limestone, Quartzite, Serpentine. |
| Florida | Limestone (shell and oolitic). |
| Georgia | Gneiss, Granite, Limestone, Marble, Sandstone, Slate, Verd-Antique Marble. |
| Idaho | Dolomite, Granite, Limestone, Marble, Sandstone, Trappean Rocks, Volcanic Rocks and Tuffs. |
| Illinois | Dolomite, Limestone, Sandstone. |
| Indian Territory | Dolomite, Granite, Sandstone, Limestone. |
| Indiana | Dolomite, Limestone, Sandstone. |
| Iowa | Dolomite, Limestone, Sandstone. |
| Kansas | Dolomite, Limestone, Sandstone. |
| Kentucky | Dolomite, Limestone, Sandstone. |
| Louisiana | Limestone, Sandstone. |
| Maine | Gneiss, Granite, Limestone, Sandstone, Slate, Trappean Rocks, Verd-Antique Marble. |
| Maryland | Gneiss, Granite, Limestone, Marble, Sandstone, Slate, Verd-Antique Marble. |
| Massachusetts | Gneiss, Granite, Limestone, Marble, Sandstone, Slate, Trappean Rocks, Verd-Antique Marble. |
| Michigan | Dolomite, Gneiss, Granite, Limestone, Sandstone, Slate. |
| Minnesota | Dolomite, Gneiss, Granite, Limestone, Quartzite, Sandstone, Slate. |
| Mississippi | Limestone, Sandstone. |
| Missouri | Diabase, Dolomite, Granite, Limestone, Sandstone. |
| Montana | Dolomite, Gneiss, Granite, Limestone, Marble, Sandstone, Trappean Rocks, Volcanic Rocks and Tuffs. |
| Nebraska | Dolomite, Sandstone, Limestone. |
| Nevada | Dolomite, Granite, Limestone, Marble, Sandstone, Slate, Trappean Rocks, Volcanic Rocks and Tuffs. |
| New Hampshire | Gneiss, Granite, Limestone, Slate. |
| New Jersey | Diabase, Dolomite, Gneiss, Granite, Limestone, Marble, Sandstone, Slate. |
| New Mexico | Granite, Limestone, Marble, Sandstone, Trappean Rocks, Verd-Antique Marble, Volcanic Rocks and Tuffs. |
| New York | Dolomite, Gneiss, Granite, Limestone, Marble, Norite, Sandstone, Slate, Trappean Rocks, Verd-Antique Marble. |
| North Carolina | Dolomite, Gneiss, Granite, Limestone, Marble, Sandstone, Serpentine, Slate, Trappean Rocks. |
| North Dakota | Dolomite, Sandstone, Limestone. |
| Ohio | Dolomite, Sandstone, Limestone. |
| Oklahoma | Dolomite, Sandstone, Limestone. |
| Oregon | Dolomite, Granite, Limestone, Sandstone, Trappean Rocks, Volcanic Rocks and Tuffs. |
| Pennsylvania | Diabase, Dolomite, Gneiss, Granite, Limestone, Marble, Sandstone, Slate, Serpentine. |
| Rhode Island | Dolomite, Gneiss, Granite, Limestone. |
| South Carolina | Gneiss, Granite, Limestone. |
| South Dakota | Limestone, Quartzite, Sandstone. |
| Tennessee | Granite, Limestone, Marble, Sandstone, Slate. |

| STATE OR TERRITORY | Present and prospective resources |
|---|---|
| Texas | Granite, Limestone, Marble, Sandstone, Slate, Trappean Rocks, Volcanic Rocks and Tuffs. |
| Utah | Granite, Limestone, Marble, Onyx, Marble, Sandstone, Trappean Rocks, Volcanic Rocks and Tuffs. |
| Vermont | Dolomite, Gneiss, Granite, Limestone, Marble, Slate, Verd-Antique Marble. |
| Virginia | Diabase, Dolomite, Gneiss, Granite, Limestone, Marble, Sandstone, Slate. |
| Washington | Granite, Limestone, Marble, Sandstone, Trappean Rocks, Verd-Antique Marble, Volcanic Rocks and Tuffs. |
| West Virginia | Calcareous Tufa, Limestone, Sandstone, Travertine. |
| Wisconsin | Dolomite, Gneiss, Granite, Limestone, Sandstone. |
| Wyoming | Granite, Limestone, Marble, Sandstone, Trappean Rocks, Volcanic Rocks and Tuffs. |

In the earlier days of the stone industry hand methods were employed almost exclusively in the work of quarrying and dressing. The past 25 years has, however, witnessed the introduction of machinery and consequent changes. The old method of drilling and blasting, formerly applied to all classes of rocks, is now done away with, excepting in the very hardest and toughest of materials, or where, in the case of granite and trappean rocks, the material is to be utilized only for roads. Even where drilling and blasting are now resorted to, it is the custom to drill a series of holes on the line along which it is desired the stone shall break; these holes are then charged somewhat lightly with a slow-burning black powder and fired simultaneously. In this way the force of the explosion is delivered along a considerable surface and the danger of shattering the material through the sudden jar is reduced to a minimum. This process is at present largely limited to granite rocks which are too hard to be quarried by means of channeling machines.

**Plug and Feather Work.**— In quarries where good breaks require that the splitting strain be exerted well down in the ledge, experience has shown that the best method for getting out the material is usually the *plug and feather* system, in which a series of holes from one and one-quarter to two inches in diameter and of a depth from two-thirds to the full thickness of the sheet are drilled at intervals depending upon the character of the stone and its manner of cleavage. Two feathers — flat pieces of steel rounded on one side to fit the curve of the drill hole — are placed at the sides of the hole and the long-tapered wedge-shaped plug driven down between them. The material splits away in fairly regular blocks which must be otherwise cut to size by hand. The plug and feather method is still extensively in use for splitting large blocks of granite and marble. Holes three inches deep and five-eighths inch in diameter will serve for splitting blocks three feet deep and five-inch holes three-quarter inch in diameter for six-foot blocks. For marble and sandstone the holes have to be slightly deeper. In soft material such as sandstone, a drill mounted on the usual tripod finds frequent use, and this is far superior to hand methods, still in certain classes of work a drill mounted on a quarry bar will do much more and better work. The advantages of the quarry bar are that all the holes are drilled to double length, intermediate ones being shallow. The lower half of the deep holes is drilled with a smaller drill bit so as to alternate the plug strain top and bottom and control the break by skillful sledging. In some instances compressed air at a pressure of 70 to 100 pounds is piped into the drill holes to extend a crack already started.

The wedges of the short hole tend to split along the top and those of the long hole split along the bottom, thus distributing the pressure and tending to split the stone in a clean, smooth plane and largely avoiding any tendency to run off. This distribution of splitting strains is to be worked out by experience in the peculiarities of the different ledges. The wedges or plugs need not in all cases be of a length equal to the depth of the holes. In some marble quarries, plug holes only five-eighths inch in diameter are put clear through the blocks, sometimes 10 feet deep, to weaken the line and ensure a straight break, the plugs, however, being shorter. This operation is much simplified by the use of the hammer-drill actuated by steam or compressed air.

**Broaching.**— In granite and other hard stones holes must be placed closer together and, as a rule, splitting across the grain is abandoned in favor of *broaching*. In this system, a series of holes is drilled, usually about three inches apart from centre to centre, leaving walls of three-quarters inch to two inches between, depending upon the hardness of the rock, and a flat bit or «broach» is substituted for the regular steel. This has a face about three inches by three-quarters inch thick and is forged with a blunt end to crush this wall or web between the holes. Drills used for broaching must have the release which is a simple device to throw the pawls out of action and allow the drill to work without rotating. Broach channeling is the best and cheapest method of cutting out key blocks, lumps, and making wall cuts, etc., in granite quarries, where the rock is too hard to be cut advantageously with the regular channeling machine.

**Channeling Machines.**— Channeling machines are utilized in the case of rocks of the nature of marble, limestone and the softer sandstone, since they would be liable to injury through blasting and since it is desired to remove the materials from the quarry bed with a minimum amount of waste and in such size and shape that they may be cut into suitable dimensions. The Wardwell channeling machine, the earliest in use, has given way to the direct-acting stone channeling machine, the design of which was based upon the conviction that the same principles which had made the Ingersoll-Sergeant drill famous would, properly applied, give the best results in cutting a channel. It was believed that the direct-acting machine possessed points of decided advantage over the slow, cumbersome diamond and lever types of rock-cutting machinery of that day. Although certain shortcomings appeared in the first models, still it is an interesting fact that some of these first machines are in service to-day after more than 15 years of continuous use and are still doing good work. The success of these pioneer types demonstrated beyond question the merit of the direct-acting principle now everywhere conceded as the correct one and it remained only to develop to the utmost the details of mechanical construction.

This machine is primarily suited for the heaviest work and the deepest cuts, in open quarries of limestone, sandstone, slate and other materials, where the output is in dimension stone. In this service it has found its greatest field in making the long, deep, longitudinal cuts which are preliminary to further breaking by the plug and feather method. It has found another valuable field of application in certain classes of heavy contracting work, such as rock excavation for canals and reservoirs.

The channeling machine is mounted on a self-propelling carriage or truck which runs on a track from 10 to 30 feet in length. If it has but one cylinder drill it is called a simplex machine; if two, a duplex machine. The stroke is about 10 inches and 250 blows are delivered per minute. The bits are usually used in gangs of three or five, set at varying angles, if the stone is uniform in texture. If uneven a single bit is used. In the usual quarrying operations the stone is channeled on two sides of a rectangle and then split off by wedges. In some instances it is channeled on three sides and also undercut at the bottom by a horizontal channeler called a «gadder.» The average cut with these channeling machines is from 8 to 16 feet in depth, depending upon the nature of the stone. The gauge or width of the cut will depend upon the final depth sought. It may be from one and one-half to four inches at the start, reducing to a width of one and one-eighth inches with the last steels. The length of the channel is limited only by the length of track which can be used. Cutting speeds vary with the quality of rock and the handling of the machine. There are cases on record where the machine channeled faces aggregating 700 square feet in 10 hours in oölitic limestone, during part of which time over 100 square feet per hour was cut. In Ohio sandstone of medium hardness, 260, 280 and 300 square feet per day of 10 hours have been channeled and these rates are being maintained as an average by the month. The average cost in this case runs from two and one-half cents to three and one-half cents per square foot cut. When channeling is done on two sides of a block the bulk of stone taken out is about three and one-third cubic feet for each square foot of face channeled. Where the machine is used on three sides, the average product is two and one-half cubic feet per square foot of channeling. The extra cost of machine work is soon recouped, as in blasting out rough rock fully 20 per cent of the bulk is lost, being outside of the dimensions, and hence not paid for.

**Helicoidal Saws.**— Experiments with the so-called helicoidal saw for quarrying the softer rocks, as limestone and marble, have met with considerable success in the larger limestone quarries of the Middle West. The large amount of labor necessary for putting the saw in position and the waste involved in cutting out the corners in which the pulleys are run are weighty disadvantages, but where long cuts can be made — 30 to 100 feet, this «saw» is very profitable. The «saw» consists of a three-strand twisted iron-wire rope, generally one-fourth of an inch in diameter, running over sliding pulleys and fed continually with abrasive material such as sand or grains of chilled iron. It is necessary in working on bedrock to sink well holes for the 20-inch pulleys on which the saw runs. It is more commonly used for making vertical cuts. With a new thin model of pulley wheels the use of this saw is increasing.

After the stone is removed from the quarry bed it is worked into the desired shape and size by a process dependent largely upon the hardness of the stone. Formerly a block after being reduced to an approximately rectangular form by means of hand *plug and feather* splitting was still further reduced by pitching tools, followed when necessary by such implements as the point, ax, peak-hammer and bush-hammer. Pneumatic tools are gradually replacing these hand implements. Pneumatic surfacing machines, lathes and planers are now in use at the larger quarries. Indeed, the production of cylindrical columns by the old hand method has been almost entirely superseded by the use of lathes similar to those used in turning metals. Except on the harder stone, like granite and quartzite, saws are extensively used for dividing up material into rectangular masses and slabs where smooth, even surfaces are desired.

**Electricity in Quarrying.**— The quarrying industry to-day constitutes an important field for the application of electric current, and the subject has become so important as to create a literature and a technology of its own, for many of the problems involved are such as do not arise in connection with other work. The flexibility of electric circuits and the general adaptability of electric power have led to a wide range of applications, some of which are still in the experimental stage. Motors and other necessary equipment have been designed for special requirements. Beginning with a small direct current station and leading up to a complete high tension transmission and converting system, the use of electricity in mining and quarrying is very similar to its application to street railway work. Special motors for the equipment of mine locomotives have been designed to meet the peculiar conditions confronted in mining and quarry work. A recent application is that of the gathering locomotive which is to a great extent replacing animal haulage completely. This locomotive is equipped with a reel and cable, supplying power to it when gathering cars from rooms where no trolley is installed and where wooden rails are used. Standard motors are applicable to and are largely used on hoists, ventilating fans and drainage pumps.

The transmission of power over long distances by polyphase alternating current is one of the most notable and important developments in electricity. It has been a chief factor in the marvelous development of the Far West. Much of the progress in the country west of the Rockies is directly traceable to the use of electricity which, in many cases, generated at a distant waterfall, is transmitted to commercial centres where the power can be used as desired. The development of the gasoline engine and its adaptation to the air compressor provide the quarryman with a cheap and effective power even in isolated locations. The success of a quarry, however, must always depend on facilities for getting the product to a market.

In a typical quarrying operation 100 men were formerly required to produce 5,000 tons of marble; now, since scrapping most of the plant and substituting modern machinery, 10 men produce 6,000 tons in the same time. The argument has been presented that mechanical methods cannot be used to the same advantage in quarrying as in the case of general manufacturing. To some extent this is true, depending upon the class of quarrying; for instance, in quarries producing rough rubble without regard to size or dimensions the mechanical features are confined to drilling, blasting and suitable hoisting apparatus and perhaps pumping or crushing, with the occasional use of steam shovels. There can be no question as to the economy of machine drilling over hand drilling, and the harder the material and the more difficult to drill by hand the greater is the advantage of machine drilling.

Successful quarries are those which closely approach the ideal of eliminating hand labor and, as in other profitable operations, are the result of heavy investments in all the machinery which can be used up to that point where additional apparatus will not reduce the waste. The modern methods of channeling, plug and feather work, power wedge hole cutters and the use of compressed air, very nearly reach this point, as it calls for few machine operators, a few men to bar out the stone so loosened and a gang of derrick men to place it on the cars for shipment in that attractive form best calculated to hold and expand the market at the highest trade price for the product. In most quarries the operating period is limited by the comparative shortness of the working season, and therein lies another advantage of machinery. Again, the smaller the force the more easily it is controlled and the better the opportunity for sifting the men down to a pick gang of machine runners, men who, at a slight addition over the prevailing rate of wages, will not only do very much more work, but will come nearer to the production of a perfect output without waste.

**Production.**— The United States Geological Survey reported for the calendar year 1921 the number of active quarries in the country at over 4,000, and the value of their combined production at $106,962,266. The State of Pennsylvania in 1919 led in the number of active quarries, 332, and in the value of the product, $21,801,754 — nearly 14 per cent of the total for the entire United States. It may be noted in passing that more than 60 per cent of this total represented limestone quarried for flux used in the iron industry. Among the other stone-producing States Vermont ranked high with an output valued at $8,555,030; New York third, with $6,885,264, and Ohio fourth, with $6,742,496.

As classified by the variety of stone produced the value in 1920 stood: limestone, $75,655,260; granite, $24,954,908; other stone, $2,291,769; marble, $11,069,585; sandstone, $7,310,290.

As classified by the uses in which it was employed the 1921 output of the quarries shows values as follows:

*Building Stone,* rough and dressed, 12,000,000 cubic feet or about 1,266,380 short tons, valued at $12,000,000, of which some was in marble, some in granite, and some in sandstone.

*Monumental Stone,* rough and dressed, $8,000,000 of which about two-thirds was in granite and the remainder in marble.

*Paving Stone,* in number 48,000,000, with a value of $3,000,000, in granite and sandstone.

*Curbing Stone,* $1,600,000, of which the bulk was in granite and in sandstone.

*Flagging,* 60,000 short tons, most of which was in sandstone.

*Crushed Stone* reached a quantity production of 43,000,000 short tons, valued at $48,000,000. The bulk of this was made up of limestone, trappean rock, granite, and sandstone. The largest value of crushed stone consumed in any one particular use was for road metal, at an average price of over $1.00 per ton. Concrete making absorbed a large amount, at an average price of about $1.00 per ton. Railroad ballast represented the third largest amount at an average price of 75 cents per ton.

Crushed limestone for furnace flux, not included in the above summary, amounted to 11,200,000 tons, valued at $11,000,000, an average of 99 cents per ton.

The quarrying of limestone was carried on quite generally throughout the United States in 1916, Pennsylvania and Ohio showing the greatest activity, with values, respectively, of $8,167,639 and $5,337,085. Other States which contributed very largely to the grand total were Indiana, with a value of $4,657,813; Illinois, $3,362,751; New York, $3,035,786; Michigan, $2,389,763, and Missouri, $1,990,419. In addition to these, Kentucky, Virginia, West Virginia and Wisconsin each showed an output in value above $1,000,000. These 11 States produced nearly 80 per cent of the entire 1916 limestone production.

Although 30 States shared in the total output of granite in 1916, the bulk of the production came from eight States. Vermont's value was $2,500,579; that of Massachusetts, $1,997,150, and that of North Carolina, $1,798,087. In addition to these, California, Maine, Minnesota, New Hampshire and Wisconsin each contributed a value of above $1,000,000.

Marble was quarried in 22 States, but nearly half of total production was by Vermont — in value, $3,062,743. Most of remainder came from Tennessee ($1,000,266) and Georgia ($903,343).

**Exports.**— The export trade of the United States in products of its quarries is well nigh world wide. In 1921 the value of such exports was $2,274,475, approximately one-half was sent overland to Canada. Great Britain appears in the record as the customer of next importtance, with purchases amounting to 10 per cent of total. Then follow in order Italy, Cuba, British East Indies, Argentina, France, Australia, Panama, British South Africa, and Brazil. Exports in 1920 had a value of $2,933,206. In the fiscal year 1922–23, exports of stone had a value of $1,500,386, of which $223,420 represented rough or dressed marble in blocks, $147,191 represented marble manufactures, $98,114 roofing slate and $361,924 other building or monumental stone.

**Imports** for the same year amounted in value to $1,253,959, of which sum $990,007 represented marble and onyx ($17,937), of which less than 20 per cent was manufactured. Most of the marble came from Italy, and the remainder from Mexico and France, with a small quantity from Greece. Mexico and Greece supplied the onyx.

There exists in the stone industry the same tendency toward the concentration of capital and the formation of stock companies as in other branches of trade. This is due not altogether to the desire for combination with a view to controlling trade, but in part at least to a change which has taken place in the character of the industry. The installation of costly machinery and the fact that the quarries in many cases now contract not merely to furnish the stone, but to furnish it cut and ready for its definite position in the structure, even if they do not contract to set it in place as well, involve a larger capitalization and supply of available funds. Consult Gillette, H. P., 'Handbook of Rock Excavation' (New York 1916); Greenwell, A., and Elsden, J. V., 'Practical Stone Quarrying' (New York 1913). See BLASTING; BUILDING MATERIALS; MINES AND MINING; MINING AND MILLING MACHINERY; POWER TRANSMISSION.

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**QUART.** See WEIGHTS AND MEASURES.

**QUARTER.** See WEIGHTS AND MEASURES.

**QUARTER-CRACK.** See SANDCRACK.

**QUARTER DAYS,** in England, the days which begin the four quarters of the year, namely: 25 March, or Lady-day; 24 June, or Midsummer-day; 29 September, or Michaelmas-day; and 25 December, or Christmas-day. In England and Ireland it is usually contracted between landlord and tenant that rent should be paid and that houses may be entered or left on these days. In Scotland there are two legal term days, Whit Sunday (15 May) and Martinmas (11 November). There are also two conventional terms, Candlemas (2 February) and Lammas (1 August), on which rents are frequently paid. In the United States, in law, quarter days are the 1st of January, April, July and October. In the relation between landlord and tenant in some of the States they are the 1st of May, August, November and February, respectively.

**QUARTER DOLLAR,** in American coinage a silver piece of the value of 25 cents. Its issue was first authorized (weight, 104 grains) by Congress in 1792, and its coinage was begun in 1796. It was reduced to 93 grains in 1853. This coin is legal tender to the amount of $10. There were no issues of the quarter dollars during the years 1798 to 1803, inclusive, 1808 to 1815 inclusive, 1817, 1824, 1826 and 1830.

**QUARTER SESSIONS.** See COURT.

**QUARTER-STAFF,** an old English weapon formed of a stout pole of heavy wood, about six feet long, loaded with iron at both ends.

**QUARTERING ACTS,** acts of the British Parliament which did away with certain of the penalties of high treason as prescribed by law in ancient times. The offender, if a man, was drawn on a hurdle to the place of execution, there hanged by the neck till he was dead, the head severed from the body, the body disemboweled and divided into four quarters, and the head disposed of at the pleasure of the king. If the offender was a woman she was drawn to the place of execution and there burned alive. By successive acts of the Parliament (30 Geo. III, ch. 48, and 54 Geo. III, ch. 146) the punishment of a female traitor was changed to hanging; and in the case of men, the Crown might change the sentence to beheading, or might remit it wholly. Under the Felony Act of 1870 hanging is made the one penalty of treason; but as the act 54 Geo. III, ch. 146 was not repealed, the offender, if a man, may by Crown warrant be beheaded.

**QUARTERMASTER,** (1) in military affairs, an officer who superintends the issue of stores, food and clothing, and arranges transportation for a regiment when necessary. In the United States army, where the quartermaster is also in charge of paying the men, only officers of the Quartermaster Corps (q.v.) are accorded this title. The officer of the line detailed in a regiment for the performance of similar functions is known as the regimental supply officer. (2) In nautical affairs, a petty officer who, besides having charge of the stowage of ballast and provisions, coiling of ropes, etc., attends to the steering of the ship. He is appointed by the captain.

**QUARTERMASTER CORPS.** In 1912 the Quartermaster Corps of the United States army was formed by the fusion of the old Quartermaster's, Subsistence and Pay Departments, all of which date back in some form or other to the first two decades of the 19th century. The resulting organization is commanded by the quartermaster-general, who ranks as a major general. The corps is subject to the general supervision of the Chief of Staff. It combines the functions of its predecessors, and takes care of all the business needs of the army which have nothing to do with munitions of war or the special supplies of the Corps of Engineers, the Signal Corps and the Medical Department. Among its duties is the provision of transport by steamboats, railroads and trains of wagons, trucks and pack animals. It furnishes the personnel of the service of supply in the zone of communications and at the front — teamsters, chauffeurs, packers, etc. It purchases stores, and distributes equipment and food, and establishes the necessary supply and commissary depots. It furnishes field bakeries to keep the troops supplied with bread. It disburses the funds necessary for the pay of the army. It contracts for all services necessary for the troops, and for the construction of such buildings as may be needed. In short, its activities are as varied as would be expected in a business enterprise of its magnitude. All officers of the Quartermaster Corps ranking as captain or over are detailed from the line. The establishment of the Quartermaster Corps is one major-general; two brigadier-generals; 21 colonels; 24 lieutenant-colonels; 68 majors; 180 captains; and such subordinate officers, non-commissioned officers and privates as the needs of the service may require. These are: pay clerks, ranking as second (or rarely first-lieutenants); field clerks, Quartermaster Corps; quartermaster sergeants, senior grade; quartermaster sergeants; sergeants, first class; sergeants, corporals, privates first class; and privates. In time of war, the Quartermaster Corps of the regular army may be supplemented by captains and majors from the Officers' Reserve Corps, and with non-commissioned officers and privates from the Enlisted Reserve Corps. At present there are first and second lieutenants in the Quartermaster Corps, branch of the Officers' Reserve Corps, but this is not a permanent provision.

**QUARTERMASTER-GENERAL,** in the army of the United States, a staff-officer with rank of brigadier-general. He is chief officer in the Quartermaster Corps (q.v.). In England he is a staff officer, specially appointed for duties connected with quartering, encamping, embarking and moving troops. In both armies in the field he is responsible for the general direction of the railway, postal, signaling and telegraph services. In the United States army he has charge of the pay service also.

**QUARTERMASTER-SERGEANT,** in the United States army, a non-commissioned officer whose duty it is to assist the quartermaster. Formerly there were company quartermaster-sergeants, but their place is now taken by the company supply and mess sergeants. There are three regimental quartermaster-sergeants to each regiment, one to each battalion. The two highest grades of non-commissioned officers in the quartermaster corps are quartermaster-sergeants, first class, and quartermaster-sergeant, respectively. (See QUARTERMASTER CORPS). In England the quartermaster-sergeant is the senior sergeant in the quartermaster's department of a regiment. He ranks next the sergeant-major.

**QUARTERN.** See WEIGHTS AND MEASURES.

**QUARTEROON.** See QUADROON.

**QUARTET,** or **QUARTETTE** (Italian *quartetto* from *quarto*, a fourth), a musical composition for four voices or instruments, in which all the parts are *obbligati*, that is to say, each is indispensable to the just performance of the piece; no one part can be omitted without injuring the proper effect of the composition. Also four persons who sing or play together. Vocal quartets are generally accompanied by instruments to sustain the voices, but the most artistic effect is produced by their perfect rendition unaccompanied. An interchange of melody, whereby the parts become in turn principal and subordinate, without any interweaving of them, does not constitute a quartet (see POLYPHONY). Quartets for stringed instruments are generally arranged for two violins, a viola or tenor violin and a violoncello. Haydn was the originator of the modern instrumental quartet, and his contemporary emulators were Mozart, Beethoven, Gietry, Sammartini, Onslow, the two Rombergs and Ries. Among later masters of the quartet form are Schubert and Brahms. See MUSIC.

**QUARTIER LATIN,** kär-tē-ā lä-tăṅ. See PARIS.

**QUARTLEY,** kwârt'lĭ, **Arthur,** American artist: b. Paris, 24 May 1839; d. New York, 24 May 1886. Coming to the United States in 1851, he studied in Baltimore and New York and was elected National Academician in 1886. His most important works are marines, and among them may be mentioned ‘New York from North River’; ‘Afternoon in August — Coast of Maine’ (1878); ‘Low Country on the North Shore of Long Island’ (1881); and ‘Off the Shoals.’

**QUARTO** (also written 4to), originally a sheet of paper twice folded, or a book made of a sheet folded twice, so as to have four leaves or eight pages to a sheet; now a book size, varying from about 15 × 11 inches (imperial quarto), to about 6½ × 9 inches. In loose usage, any volume of large pages.

**QUARTODECIMANS,** kwar-tō-dĕs'ĭ-manz, the name given to those Christians in the early centuries who celebrated the Easter festival on the same day as the Jews celebrated the Passover, namely, the 14th day of the month Nisan. Most of the churches, both of the East and West, celebrated the Christian Passover always on the *Sunday* next succeeding the day observed by the Jews, never on 14th Nisan, even if that day was Sunday. The Council of Nice (325 A.D.) enjoined on all the faithful this rule; thereafter the Quartodecimans were held to be heretics.

**QUARTZ,** the name given the native oxide of silicon, $SiO_2$. It is a widely distributed mineral occurring not only in veins and segregated masses, but as a common constituent of igneous rocks. Detrital grains form sands, and when cemented, sandstones and quartzites. Owing to differences in color and texture and its use as a semi-precious stone, the names given varieties of quartz are many. All these varieties, however, are included in two classes, the plainly crystalline or vitreous, and the obscurely crystalline called crypto-crystalline. All varieties have about the same hardness, seven, that is, can scratch window glass, and nearly the same specific gravity, 2.6. Pure quartz is fusible only at high temperatures.

Quartz crystallizes in the rhombohedral system, generally as six-sided prisms usually terminated at each end by six-sided pyramids. Among the crystalline varieties of quartz are rock crystal, amethyst, smoky quartz, rose quartz, milky quartz, the mineral being colorless when pure, but ranging through various shades of yellow, red, brown, blue and green to black when impure. Colorless quartz, or rock crystal, is often cut into gem shapes and sold as Lake George diamonds, Brazil pebbles, etc. Perfectly clear crystals of larger size are highly prized in Japan when cut and polished as spheres. Recently developed uses of rock crystal are in the manufacture of fibres for suspending the minute magnets and mirrors used as galvanometers and in the manufacture of spectrum tubes and test tubes, the quartz being fused by the oxyhydrogen blowpipe. Quartz fibres are used for galvanometers because they show no torsion and the minors have no permanent set or deviation from the true position when at rest. Vessels made of fused quartz can be heated to a white heat and plunged into cold water without injury and on this account quartz tubes are used for studying the spectra gases at high temperatures.

Of the colored varieties of crystalline quartz amethyst is clear purple or bluish-violet, and is popular as a gem; rose quartz, which always occurs massive, is rose red or pink; yellow quartz, or citrine, is often called topaz by jewelers, but may be distinguished from true topaz by its inferior hardness; smoky quartz, called also cairngorm stone, varies in color from smoky yellow to brownish black; milky quartz, white, nearly opaque and often with a greasy lustre, is of common occurrence in veins; sagenitic quartz has inclusions of needle-like crystals of rutile, actinolite, asbestos (cat's-eye) or black tourmaline; sapphire quartz, indigo blue in color, is a rare variety. Many quartz crystals contain small cavities partly filled with liquids, generally water, also inclusions of carbonic acid, either liquid or gaseous. The cryptocrystalline varieties of quartz include chalcedony, and its varieties, carnelian, chrysoprase, prase, plasma, agate, onyx and sardonyx; also flint, hornstone, touchstone and jasper. Chalcedony has a wax-like lustre, is translucent or transparent, and its color varies from white through pale brown to dark brown or black, though it is occasionally blue; carnelian or sard, is a red or brownish-red chalcedony; chrysoprase an apple-green variety; prase, a dull darker green; plasma, a leek green or emerald green; bloodstone, a dark green chalcedony with small red spots, like drops of blood; agate, a chalcedony with delicate parallel bands of color, or irregularly clouded color effects, the colors being white, red, brown or even blue, while moss agate contains moss-like forms caused by oxide of manganese; in onyx the differently colored bands are straight and parallel; sardonyx is onyx containing bands of carnelian (sard); flint differs from chalcedony in being more opaque, having a slightly vitreous lustre, being generally gray or brown in color; it breaks with a sharp cutting edge; it was used by the early races of men for arrow heads, knives, etc.; hornstone resembles flint, but has a splintery fracture, and is often white; touchstone, known also as basanite or Lydian stone, a black hornstone or jasper, used for testing the purity of precious metals by rubbing them on it; jasper differs from the preceding varieties in being entirely opaque; it is often red, yellow or brown.

Common milky quartz is used for a variety of purposes. In metallurgical operations it is used as a flux in smelting iron and copper ores; when finely crushed it is used by porcelain manufacturers for making glazes, quartz sand and ground pure quartz are used in immense quantities for making glass. Another use is as an abrasive, either as sandpaper or as sand or a fine powder. In these forms it is used for dressing stone, wood and leather; while the powder, mixed with soap, forms a widely advertised cleansing compound. See MINERAL PRODUCTION OF THE UNITED STATES.

**QUARTZ MONZONITE.** An igneous rock resembling granite in general appearance but of mineral composition intermediate between syenite and diorite and with less quartz than granodiorite. Several of the well-known New England «granites» and the gray «granites» of Minnesota and California are mostly quartz monzonite or granodiorite.

**QUARTZORITE.** An igneous rock of granular structure, mostly of dark color and extensively quarried as a variety of granite. The chief feldspar is plagioclase with which occur free quartz, generally some orthoclase and some of the darker silicates such as biotite, hornblende and augite. It is closely related to granodiorite and quartz monzonite and is chemically similar to dacite which is supposed to be an effusive equivalent.

**QUARTZ PORPHYRY,** an igneous rock characterized by containing crystals of quartz and feldspar with sometimes biotite and more rarely hornblende scattered through a ground mass that is glassy or contains fine crystals of quartz and feldspar. The name was formerly given to free Tertiary rhyolites and is still applied to rhyolites that have crystallized as dikes or laccolites rather than as surface flows, but these distinctions have little value. In general quartz porphyries differ from rhyolites simply in being denser. Quartz trachyte is a name given rhyolite by European geologists. Quartz porphyries are of quite common occurrence in the Western States and are of peculiar importance at Leadville, Colo. See RHYOLITE.

**QUARTZITE,** a rock of common occurrence in mountain ranges or when strata have been strongly folded. It is simply a metamorphosed sandstone, its hardness and rather crystalline character being due to the cement of crystalline quartz that surrounds the grains of the original sandstone. A sandstone containing clay becomes a quartzite containing mica, and thus quartzites grade into quartz-schists and mica-schists. In general quartzites resist weathering and thus form ledges. They differ greatly in color.

**QUASI-CONTRACT.** A quasi-contract — often called a constructive contract — is one founded solely on an obligation of law and not upon the intention or consent of the parties. Such contracts are imposed by law on the theory that they are dictated by reason and justice. Quasi-contracts are usually founded (1) on a record, as a judgment; (2) on a statutory, official or customary duty, as the obligation of a husband to pay for necessaries supplied his wife; (3) on the doctrine that no one should be allowed to enrich himself unjustly at another's expense, as the liability to repay money paid by mistake of fact. A marked distinction between a quasi-contract and a true contract is that the latter is founded upon the consent of the parties thereto, whereas the former is founded on a legal obligation without any consent of the parties. As has been aptly said in the case of consensual contracts the agreement defines the duty, while in the case of quasi-contracts the duty defines the contract. Much real difficulty has been experienced in distinguishing between quasi-contracts and implied contracts, and some authorities hold that the distinction appears to be one of degree rather than of principle. There is authority for the statement that implied contracts embrace those in which there is an intent to contract or at any rate no intent not to contract. But in many cases of what are commonly called implied contracts the only intent apparent is in the imputation of knowledge that the law would impose a certain liability. This element is also present in many quasi-contracts. The test of definite intention not to contract, if applied to quasi-contracts, would exclude some from this classification, for example, an obligation to repay money paid by mistake of fact. Some authorities differentiate a quasi-contract from an implied contract by holding that the former is a mere legal fiction, a form imposed to adapt the case to a certain remedy, in which intention is disregarded, whereas in an implied contract the intent is ascertained and enforced and according to the common understanding of men the intention to contract is mutual. Quasi-contracts are enforced by an action *ex contractu.*

By some earlier authorities the term «implied contracts,» is made to include (1) contracts implied in fact and (2) quasi or constructive contracts. In the former the intention to contract may be inferred to exist by the acts of the parties, while in the latter there is an absence of all intent to contract. This classification is favored by some authorities today.

Among typical cases of quasi or constructive contracts, in addition to those mentioned above, are the following: cases of account stated, from which an obligation in law arises which will cause an action of *assumpsit* or debt to lie; cases in which one person has been obliged to pay money which another should have paid and which the former may recover from the latter in an action in *assumpsit* for money paid to his use; cases in which one person has received money which another should have received, for which an action will lie for money had and received; cases in which a person by wrongfully taking and retaining property is obligated by law to pay a reasonable price therefor; cases in which it is impossible for the plaintiff to complete a contract and in which he may recover for the value of what he has already performed; cases in which a defendant is in default under a contract which cannot be enforced because not in compliance with the Statute of Frauds and the plaintiff may recover for past performance; cases in which a person is under a legal obligation to pay money and another pays it without request for him, in which event the money may be recovered by an action at law. See CONTRACT.

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**QUASIMODO,** in the Roman calendar, a term applied to the first Sunday after Easter, from the opening words of the introit for that day, «*quasi modo geniti infantes,*» as infants lately born. Also the name of a well-known character in Victor Hugo's novel ‹Notre Dame de Paris.›

**QUASS,** kwăs, or **KVASS,** a Russian beverage, made by pouring warm water on rye or barley meal. It is sour and fermented.

**QUASSIA,** a genus of shrubs and trees of the order *Simarubaceæ.* The best known species (*Q. amara*) is indigenous to tropical America, grows about 12 feet tall, bears large pinnate leaves with winged petioles and racemes of bright red blossoms. The wood is used for cabinet making and for furniture, since it is avoided by insects. It is excessively bitter, and was formerly in repute as a medicine and for augmenting the bitterness of ale, porter, beer and similar beverages. It is known also as bitterwood, by which name the wood of *Picræna excelsa* is likewise designated and used as a substitute for true quassia with which it vies in bitterness.

**QUATERNARY,** according to the United States Geological Survey, the last period of the Cenozoic era. It follows the Tertiary and includes the present. It is divided into the Pleistocene and Recent epochs, the former of which includes the great Ice Age, or Glacial Period. Some authorities disregard Quaternary and give Pleistocene and Recent the rank of periods. See GLACIAL PERIOD and PLEISTOCENE.

**QUATERNIONS. Fundamental Principles.**— A quaternion, or «set of four,» is a quadrinomial of the form

$$w + xi + yj + zk,$$

in which $w$, $x$, $y$, $z$ are numbers, and 1, $i$, $j$, $k$ are four independent units, any three of which may be interpreted geometrically as a set of mutually perpendicular straight lines of unit length in three-dimensional space. The binary products $xi$, $yj$, $zk$ are three mutually perpendicular line-segments of lengths $x$, $y$, $z$ respectively; they are called *vectors,* while pure numbers, positive or negative, are called *scalars.*

The calculus of quaternions is an algebra in which the fundamental operations of addition, subtraction, multiplication and division, and the consequent operations of involution, evolution, etc., are employed, and whose elements (operators and operands) are quaternions. It is a multiple algebra, because a quaternionic symbol, as $q$, contains implicitly several independent quantities, and it is essentially geometric, because its operations, addition, multiplication, etc., may be interpreted as geometric transformations. For example, in illustration of the last statement, if $q$, $r$ be two quaternions and be taken to represent two line-segments meeting at a point, their sum is the diagonal of the parallelogram of which $q$ and $r$ are two adjacent sides. This is known as geometric addition; its law is that of the parallelogram of forces. Multiplication by a quaternion is equivalent to an orthogonal transformation in four variables plus an expansion or a contraction. The geometrical construction of a quaternion product, however, needs the hypothesis of a four-dimensional space for its proper presentation.*

Vectors in particular are so defined as to obey the law of geometric addition. If several vectors represent the successive parts of a broken line in space, their sum is the line-segment joining the free ends of the broken line. In this process of addition the line-segments representing vectors may be transferred to any position in space, provided they remain parallel to their original directions, but the direction-sense must in every case be preserved.

In obedience to this interpretation a quaternion may always be written as the sum of a scalar and a three-dimensional vector; thus,

$$q = Sq + Vq,$$

wherein $S$ and $V$ are to be read «scalar of» and «vector of» respectively; for by the law of geometric addition $xi + yj + zk$ is itself a vector, while $w$, being a pure number, is by definition a scalar.

In the quaternion algebra the laws of association and distribution in the four fundamental operations, and the law of commutation in addition and subtraction, are assumed, or they may be derived from the geometrical definitions of the processes, but the commutative law in multiplication and division is rejected except for such quaternions as have vector parts that are numerical multiples of one another.

The laws of combination by multiplication are determined in the following manner: The mutually perpendicular vectors $xi$, $yj$, $zk$ are numerical multiples of the three independent units, $i$, $j$, $k$, and the combinatory laws for these units are derived from the assumptions

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* See "Bulletin of the American Mathematical Society" (Vol. 11).

$$i^2 = j^2 = k^2 = -1, \quad ijk = -1,$$

from which are obtained, through multiplication by $i$, $j$, $k$ in succession, the remaining binary products

$$jk = -kj = i, \quad ki = -ik = j, \quad ij = -ji = k.$$

From these laws it follows that the product of two quaternions is itself a quaternion. Thus $q$ and $r$ being given quaternions,

$$q = w + xi + yj + zk,$$
$$r = w' + x'i + y'j + z'k,$$

their product has the form

$$qr = W + Xi + Yj + Zk,$$

wherein

$$W = ww' - xx' - yy' - zz',$$
$$X = wx' + w'x + yz' - y'z,$$
$$Y = wy' + w'y + zx' - z'x,$$
$$Z = wz' + w'z + xy' - x'y.$$

If the order of the factors in this product be changed from $qr$ to $rq$, the scalar part $ww' - xx' - yy' - zz'$ is unaltered, but the terms $yz' - y'z$, $zx' - z'x$, $xy' - x'y$ change their algebraic signs and, therefore, the vectors of $qr$ and of $rq$ are different. This result shows that in general quaternion multiplication does not obey the commutative law. In order that the above terms may not change sign (by a reversal of the order of the factors $q$, $r$) they must be separately zero, that is,

$$\frac{y}{y'} = \frac{z}{z'}, \quad \frac{z}{z'} = \frac{x}{x'}, \quad \frac{x}{x'} = \frac{y}{y'},$$

in other words, $x'$, $y'$, $z'$ must be the same numerical multiples of $x$, $y$, $z$ respectively. This makes $x'i + y'j + z'k$ a numerical multiple of $xi + yj + zk$, and it is the condition under which it is permissible to write $qr = rq$.

Division is interpreted by introducing the reciprocal, defined by the equation $qr = 1$, in which $q$ and $r$ are said to be reciprocal to one another, and, as in ordinary algebra, we write $r = q^{-1}$ and $q = r^{-1}$. This product obviously obeys the commutative law and also it has no vector part, so that

$$x' = nx, \quad y' = ny, \quad z' = nz, \qquad [n = \text{a number}]$$

and

$$wnx = -w'x, \quad w' = -nw.$$

Hence the reciprocal of $q$ must have the form

$$q^{-1} = \frac{1}{m}(w - xi - yj - zk),$$

where $m$ is a number. By forming the product $qq^{-1}$, observing the laws $i^2 = j^2 = k^2 = -1$, $ij = -ji = k$, etc., it is easily shown that

$$m = w^2 + x^2 + y^2 + z^2.$$

This number is called the *norm* of $q$.

It is now evident that if $r = w' + x'i + y'j + z'k$ and $q = w + xi + yj + zk$, the quotient $rq^{-1}$ is obtained by writing out the product

$$(w' + x'i + y'j + z'k \,.\, \frac{1}{m}\, w - xi - yj - zk),$$

and that this quotient is a quaternion.

Hence, barring critical cases, such as division by zero, indeterminate forms, etc., the application of the four fundamental processes of algebra to quaternion symbols leads always to determinate quaternion results. The quaternionic algebra is, therefore, a closed system and satisfies the definitions of a group with respect to addition, multiplication, subtraction or division. See GROUPS, THEORY OF.

The positive square root of the norm of $q$ $(= +\sqrt{w^2 + x^2 + y^2 + z^2})$ is called its *tensor* and the quotient of $q$ by tensor of $q$ is called its *versor*, so that a quaternion is always the product of its tensor and versor. The symbolic form of this statement is

$$q = Tq \cdot Uq,$$

where $T$ and $U$ stand for tensor and versor respectively.

In the strictly symbolic notation the reciprocal of $q$ has the form

$$q^{-1} = \frac{Sq - Vq}{T^2q},$$

and since $qq^{-1} = 1$ it follows that

$$S^2q - V^2q = T^2q.$$

The quaternions $Sq + Vq$ and $Sq - Vq$ are said to be *conjugates* of one another.

A vector has no scalar part, but it has a tensor factor and a versor (vector of unit length); and a scalar has no versor part, but it has a tensor, its positive numerical value, and a versor whose value is always ± 1. It can readily be shown that the square of the versor of a vector is $-1$. Let the versor be $\dfrac{xi + yj + zk}{\sqrt{x^2 + y^2 + z^2}}$.

Its square will be

$$\frac{-x^2 + y^2 + z^2}{x^2 + y^2 + z^2} + i\left(\frac{yz - yz}{x^2 + y^2 + z^2}\right)$$
$$+ j\left(\frac{ZXZX}{x^2 + y^2 + z^2}\right) + k\left(\frac{xy - xy}{x^2 + y^2 + z^2}\right) = -1.$$

The symbolic statements are

$$Vq = TVq . UVq,$$
$$Sq = \pm TSq.$$

Therefore, also,

$$V^2q = -T^2Vq, \quad S^2q = T^2Sq.$$

The equation $S^2q - V^2q = T^2q$ may now be written

$$S^2q + T^2Vq = T^2q,$$

and hence, $\theta$ being an appropriate angle, it may be assumed that

$$Sq = Tq . \cos\theta, \quad Vq = Tq . UVq . \sin\theta.$$

By the introduction of these expressions for scalar and vector the quaternion is presented in a new binomial form

$$q = Tq(\cos\theta + UVq . \sin\theta),$$

one of great importance and utility.

The formula last written is a particular case of a more general geometric law. A recent interpretation makes quaternion symbols represent straight-line segments (their directions include) in four-dimensional space.* Interpreted in this way quaternions are called *directors*. It is shown that if two quaternion directors be perpendicular to one another their quotient is a vector. Let $\theta$ be the angle between $p$ and $q$, let $s$ be the director perpendicular dropped from the terminal extremity of $q$ to $p$, and $r$ the director from the origin

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* "Transactions of the American Mathematical Society (Vol. 2, pp. 183–214, and Vol. 3, pp. 46–59).

(intersection of $p$, $q$) to the foot of this perpendicular. Then by geometric addition

$$q = r + s$$

and

$$q/p = r/p + s/p;$$

and $s/p$, being the quotation of a pair of mutually perpendicular directors, is a vector. Hence, since if $\rho$ be the ratio $Us/Up$, it is a unit vector,

$$q/p = \frac{Tq}{Tp}(\cos\theta + \rho \sin\theta).$$

When $p = 1$ this equation reduces to the one previously written for the value of $q$. In this particular case $\theta$ becomes the angle formed by the quaternion director $q$ with the axis of real quantities, or scalar axis. When $p$ and $q$ are both vectors the formula expresses the fact, on which Hamilton early places emphasis, that the ratio of two vectors is in general a quaternion, but that if the vectors meet at a right angle the ratio is another vector, if they be parallel it is a scalar. But the formula also shows that these statements are true of quaternions in general.

The two parts of the equation last written present the quaternion under its three most fundamental aspects:

1. It is the ratio of two directed, non-posited,* straight-line segments.
2. It is the sum of a number and a directed, non-posited vector.
3. It is the product of a tensor (tensor of $q/p$) and of a versor, the latter being expressed in terms of its angle $\theta$, and its vector axis $\rho$.

The geometrical and kinematical interpretations of geometric addition and subtraction involve no special difficulties. They are fully explained in a variety of treatises in which this subject has its natural place, particularly in those parts of mathematical physics where the composition of velocities and of forces is explained. The first full exposition of the subject was given in the celebrated 'Barycentrische Calcül' of Möbius, published in 1827, and was, therefore, well known about 16 years before the invention of the calculus of quaternions by Hamilton.

The non-commutative character of multiplication greatly enlarges its powers of expression and discrimination, but it also introduces troublesome transformation processes and calls for extended analysis. Fully expressed, the quaternion product has the double form $q(\,)q_1$ and involves eight scalar quantities. A first step in its analysis resolves it, in either of two important ways, into simpler factors:

1. Since by the law of association

$$q(\,)q_1 = 1[q(\,)1]q_1 = q[1(\,)q_1]1,$$

it consists of the two special commutative operators $q(\,)1$, $1(\,)q_1$, applied in succession, or simultaneously, at pleasure.

2. It is always possible to determine four versor quaternions $r$, $s$, $r_1$, $s_1$, that satisfy the following conditions:

$$Uq = rs = sr, \quad Uq_1 = r_1^{-1}s_1 = s_1r_1^{-1},$$

and

$$Sr = Sr_1, \; Ss = Ss_1.\dagger$$

The given product then assumes the form $mq(\,)q_1 = mr[s(\,)s_1]r_1^{-1} = ms[r(\,)r_1^{-1}]s_1$, where $m$ is a number. It consists of a tensor factor and two rotational transformations $r(\,)r_1^{-1}$, $s(\,)s_1$ which are commutative and may be applied simultaneously, or in succession.

The interpretation of the special products $q(\,)1$, $1(\,)q_1$, $r(\,)r_1^{-1}$, $s(\,)s_1^{-1}$, as motions, «turns,» and «rotations,» generally in a space of four dimensions, has been successfully achieved.* An adequate account of them, however, would expand this notice beyond permissible limits. No accurate description of the motion represented by the general product $q(\,)q_1$ has yet been given.

A simpler case than any of the preceding is the product $q(\,)q^{-1}$. Its complete interpretation as a rotation in three-dimensional space was an early achievement by Hamilton himself. The motion consists of a rotation through twice the angle of $q$ ($q$ being given in the form $m[\cos\theta + \rho\sin\theta]$) about the vector of $q$ as an axis; that is, any vector, placed at the origin, moves through the angle $2\theta$, on the surface of a cone having its vertex at the origin.†

Quaternion multiplication may be expressed in terms of matrices. This fact was first established by Peirce,‡ afterward verified by Spottiswoode,§ but more explicitly by Cayley.|| It has also been shown that every similarity transformation in four variables is expressible as a quaternion product.¶ Such facts as these bring out clearly the multiple character of the quaternion algebra.

The further development of the theory of quaternions, which follows the exposition of fundamental principles outlined in the preceding paragraphs, includes the deduction of the formulæ of scalar and vector products and quotients, the interpretation and transformation of quaternion expressions in general, the differentiation of quaternions, the solution of equations, especially of equations of the first degree, and the analytical theory of quaternions.

But although the works of Hamilton and Tait contain a large mass of material concerning particular quaternion transformations, the general Analytical Theory of Quaternions has yet to be written. A brief outline sketch of a method is given by Cayley in the sixth chapter of Tait's Treatise.

**Applications.**— It is impossible, in the space permitted to this notice, to do more than name some of the subjects in which the method of quaternions finds its applications. The most important of these to which writers have thus far given attention are the following:

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* Not placed in a definite position.

† "Proceedings of the American Association for the Advancement of Science" (Vol. 33, 1884, pp. 55–56).

* See Hathaway in "Transactions of the American Mathematical Society" (Vol. 3, 1902, pp. 46–59), and Stringham in "Proceedings of the American Association for the Advancement of Science" (Vol. 33, 1884, p. 56).

† Tait's 'Treatise on Quaternions' (3d ed., pp. 75 and 289)

‡ In a footnote in Linear 'Associative Algebra,' *American Journal of Mathematics* (Vol. 4, 1881, p. 132).

§ In 'Proceedings of the London Mathematical Society' (Vol. 4, 1872, pp. 156–159).

|| In Tait's 'Treatise on Quaternions' (3d ed., p. 148), and Cayley's 'Mathematical Papers' (Vol. 12, pp. 311–313).

¶In 'Transactions of the American Mathematical Society' (Vol. 2, 1901, pp. 186, 187). See also the references to Cayley and Klein on page 184 of this volume, and 'Compte Rendu du deuxième Congrès Internationale des Mathématiciens' (Paris, 1900, p. 336).

The theory of matrices; orthogonal transformation; geometry of the straight line, of the plane, of the sphere, of the cyclic cone, of surfaces of the second order, of curves and surfaces in general, and of planes in four dimensional space; kinematics of a point, of a rigid system and of deformable systems; axes and moments of inertia; statics of a rigid system; kinetics of a rigid system; precession and nutation; the problems of the pendulum; geometrical and physical optics; electrodynamics; the solenoid; applications of the operator, $\nabla = i\frac{d}{dx} + j\frac{d}{dy} + k\frac{d}{dz}$, and of Laplace's operator $\nabla^2$, to physical analogies, to line, surface and volume integrals, to the stress function; application of the $\nabla$ integrals to magnetic problems; the hydrokinetic equations; applications of $\nabla$ in connection with Taylor's theorem and the calculus of variations.

By far the greater portion of extant knowledge of quaternions, both of the theory and of its applications, is due directly to Hamilton and is published in the 'Elements,' but the applications to physical problems were mainly contributed by Tait and are embodied in the 12th chapter of his 'Treatise.'

**History.**— The development of the quaternion calculus as an analysis of space relations was the work of Sir William Rowan Hamilton, Andrews professor of astronomy in the University of Dublin and royal astronomer of Ireland. The effort to create a new calculus of this type was a natural sequence of the many attempts that had been made to interpret geometrically the so-called imaginary and complex algebraic expressions of the forms $a\sqrt{-1}$ and $a + b\sqrt{-1}$. These attempts are recorded in the earlier works whose titles are given in the following bibliography.

Hamilton laid the foundations of the new subject during the years 1833–43. In November of the latter year his first paper on 'Researches respecting Quaternions' was presented to the Royal Irish Academy. His first full exposition of quaternion theory was published in 1853 in his 'Lectures on Quaternions,' a book of over 700 pages.

Meanwhile, in 1844, Grassmann published his now celebrated work, 'Die Ausdehnungslehre,' which occupies common ground with quaternion theory, but plans a much wider range of investigation than was contemplated by Hamilton in his system. The two systems have a common body of fundamental principles, but they have different points of view, different notations and in part different purposes. Both form the foundations upon which all subsequent work of the kind must stand.

Hamilton's 'Elements of Quaternions,' which still remains the storehouse of knowledge for its subject, was a posthumous work, published in 1866. A new edition has recently appeared in two volumes.

After the work of Hamilton and Grassmann had been finished the next most important forward step in the creation of new algebras was taken by Benjamin Peirce in his essay on 'Linear Associative Algebra,' presented to the National Academy of Sciences at Washington in 1870, subsequently published in the *American Journal of Mathematics* (1881). In this work the author enumerates the types of linear associative algebras, and classifies them by a set of criteria which takes account of the number and the assumed laws of combination of their irreducible elements (extraordinaries, or vids). These laws are exhibited in the form of a series of multiplication tables.

Some of the more recent attempts to apply the quaternion analysis and the Ausdehnungslehre to physical problems have appeared under the title of 'Vector Analysis,' sometimes with modified, sometimes with wholly changed notations. Of these the contributions of Willard Gibbs and of Heaviside should be mentioned as of special importance. See VECTOR ANALYSES.

**Bibliography.**— Buchheim, 'A Memoir on Biquaternions,' in *American Journal of Mathematics* (1885); Grassmann, H., 'Die Ausdehnungslehre' (1844, 1862, 1878); Hamilton, 'Lectures on Quaternions' (1853); id., 'Elements of Quaternionns (1886); Hathaway, 'Quaternion Space,' in *Transactions of American Mathematical Society* (1902); Kelland and Tait, 'Introduction to Quaternions' (1873, 1882); Möbius, 'Der Barycentrische Calcul' (1827); Tait, 'Treatise on Quaternions' (1867, 1873, 1890). For further references consult Macfarlane, A., 'Bibliography of Quaternions' (Dublin 1904).

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**QUATRAIN**, a poetical stanza of four lines, usually rhyming alternately; loosely, a poem of four short stanzas.

**QUATRE-BRAS**, kätr-brä («four branches»), Belgium, in the province of Brabant, at the intersection of the main roads from Brussels and Charleroi and from Namur to Nivelles, about 20 miles south-southeast of Brussels. It is famous for the battle fought here, 16 June 1815, between the English under Wellington and the French under Ney. It was Napoleon's plan at the opening of the campaign of 1815 to fight the armies of the allies singly, as he felt himself unable to cope with their combined forces. At the head of an army of 129,000 men, supported by 350 guns, he made a rapid march into Belgium, crossing the Sambre almost before the allies were aware of his movements. His army was divided into three corps: the right wing, 48,000 strong, being under Grouchy; the centre, of 28,000 men, under the emperor himself; and the left wing, of 48,000, under Ney. The Prussians and English under Blücher and Wellington lay between the French and Brussels. With the right wing and centre of his army Napoleon furiously attacked the Prussians, who, after a severe struggle, retired upon Wavre 16 June. On the same day Ney attacked Wellington at Quatre-Bras. The English, 32,000 strong, repulsed Ney, and maintained their position, though at a loss of over 5,000 men, including the Duke of Brunswick. The English general, hearing of the retrograde movement of the Prussians, fell back on the 17th on Waterloo, where the decisive battle was fought on the following day. See WATERLOO.

**QUATRE-VINGT-TREIZE**, kätr-văṅ-trāz ('Ninety-Three'), a work of historical fiction by Victor Hugo, published in 1874. The time is, as the title indicates, 1793. The scene is Vendée, during the civil war. In its style it displays much unevenness, but in its characters, vivid scenes and tragic catastrophe ranks among the author's best.

**QUATREFAGES DE BREAU**, kätr-fäzh dė brā-ō, **Jean Louis Armand de**, French naturalist: b. Berthezène, Gard, France, 10 Feb. 1810; d. Paris, France, 12 Jan. 1892. He was graduated from the University of Strassburg and in 1832 settled in Toulouse where he practised medicine and shortly afterward founded the *Journal de Médecine et de Chirurgie de Toulouse*. In 1838–40 he occupied the chair of zoology at the University of Toulouse and in the latter year removed to Paris, where he made a special study of invertebrates. In 1850 he was appointed professor of natural history at the Lycée Napoléon, Paris, and in 1855 professor of anthropology at the Musée d'Histoire Naturelle, which post he occupied until his death. He was elected to the Academy of Sciences in 1852 and was widely known by his anthropological investigations. He was the first expounder of the doctrine of phlebenterism, and was strongly opposed to Darwin's theories. He was the author of many important works on zoology and anthropology, among which are ‘Considérations sur les caractères zoologiques des rongeurs’ (1840); ‘De l'Organisation des Animaux sans vertèbres des côtes de la Manches’ (1844); ‘Recherches sur le Système nerveux, l'Embryogénie, les Organs des Sens, et la Circulation des Annélides’ (1844–50); ‘Physiologie Comparée, Metamorphose de l'Homme et des Animaux’ (1862); ‘Souvenirs d'un Naturaliste’ (1854); ‘Histoire Naturelle des Annelés Marins et d'Eau Douce’ (1865); ‘Les Polynésiens et leurs Migrations’ (1866); ‘La Rochelle et ses Environs’ (1866); ‘Rapport sur les Progrés de l'Anthropologie’ (1867); ‘Ch. Darwin et ses Frecurseurs français’ (1870), an attack on Darwinianism; ‘La Race Prussienne’ (1871); ‘L'Espèce Humaine’ (1877); ‘Nouvelles Etudes sur la Distribution Géographique des Negritos’ (1882); ‘Hommes Fossiles et Hommes Sauvages’ (1884); ‘Introduction à l'Etude des Races Humaines’ (1887–89); ‘Théories Transformistes’ (1892); a series of papers entitled ‘Etudes sur les Types Inferieurs de l'Embranchement des Annelés’; and he also contributed a large number of articles to the *Revue des Deux Mondes* on the results of his scientific researches along the Atlantic and Mediterranean coasts and throughout Italy and Sicily.

**QUATREFOIL**, kätr-foil, *in heraldry*, a bearing displaying a conventionalized flower of four leaves; *in architecture*, an opening or a panel divided by cusps or foliations into four leaves, or, more correctly, the leaf-shaped figure formed by the cusps. It is an ornament which has been supposed to represent the four leaves of a cruciform flower, and is common in the tracery of Gothic windows. Bands of small quatrefoils are much used as ornaments in the perpendicular Gothic style and sometimes in the decorated.

**QUATREMERE**, kätr'-mär, **Etienne Marc**, French Orientalist: b. Paris, France, 12 July 1782; d. there, 18 Sept. 1857. He was educated at the Collège de France, was employed at the Bibliothèque Impériale in 1807, and in 1809 accepted the chair of Greek in the University of Rouen. He was elected to the French Institute in 1815, became professor of Hebrew at the Collège de France in 1819, and in 1838 was made professor of Persian in the School for Living Oriental Languages. He made numerous valuable translations and was author of important geographical and historical works in addition to his work as an Orientalist. He published ‘Recherches Critiques et Historiques sur la Langue et la Littérature de l'Egypte’ (1808); ‘Mémoires géographiques et historiques sur l'Egypte’ (1811); ‘Mémoir le sur Nabateens’ (1835); ‘Histoire des Mongols de la Perse’ (1836); ‘Histoire des Sultans Mamelouks’ (1837–45), etc. His extensive library, including a great number of old Eastern manuscripts, is preserved in the royal library at Munich.

**QUATREMÈRE DE QUINCY**, dė kăṅ-sē, **Antoine Chrysostome**, French archæologist and politician: b. Paris, 28 Oct. 1755; d. there, 8 Dec. 1849. He was prominent politically under the republic, consulate, empire and restoration, in 1791 having been deputy to the legislative assembly for Paris. After the dissolution of the assembly, he was 13 months in prison, and after the proscriptions of 1793 he became one of the leaders of the insurrection of 5 Oct. 1795, for which he was condemned to death. He was later acquitted and in 1797 represented the Seine in the Council of Five Hundred, but for his opposition to the revolutionists was banished, 5 Sept. 1797. The consuls recalled him in 1799 and in 1800 he was appointed secretary to the council of the Department of the Seine; later was appointed to the class of history and ancient literature in the National Institute; was made permanent secretary of the Academy of Beaux-Arts in 1816 and was editor in that department of the *Journal des Savants;* elected professor of archæology at the Royal Library in 1818 and serving as deputy in 1820–21. He wrote ‘Dictionnaire de l'Architecture’ (1786–1825); ‘Histoire de la vie et des Ouvrages de Rafaël’ (1824); ‘Canova et ses Ouvrages’ (1834); ‘Le Jupiter Olympien, ou l'art de la sculpture antique’ (1814); a treatise on ancient sculpture in ivory and gold; ‘Essais sur l'Imitation dans les Beaux-Arts’ (1823); ‘Monuments et Ouvrages d'art antique restitués’ (2 vols., 1826–28); ‘Histoire de la vie et des Ouvrages des plus célèbres Architectes’ (1836), etc.

**QUATROCENTO**, kwät-rō-chĕn'tō, *in art*, a term applied to the characteristic style of the artists of the 15th century, that is 1400 and odd; it was hard, rigid and peculiar in color as well as in form and pose. It was the intermediate stage of that progressive period of art which, commencing with Fra Angelico, reached excellence with Leonardo da Vinci.

**QUAY**, kwā, **Matthew Stanley**, American politician: b. Dillsburg, York County, Pa., 30 Sept. 1833; d. Beaver, Pa., 28 May 1904. He was graduated from Jefferson College in 1850, studied law, was admitted to the bar in 1854 and elected prothonotary of Beaver County in 1856 and 1859. During the Civil War he was in active service as colonel of the 134th Pennsylvania regiment, being present at the battle of Fredericksburg; he was also assistant commissary general of Pennsylvania, State military agent at Washington and military secretary to the governor. In 1865–67 he was a member of the Pennsylvania legislature; in 1872–78, and again in 1879–82, he was State secretary; recorder for the city of Philadelphia in 1878–79; and State treasurer in 1885. As early as 1869 he was secretary of the executive committee of the Republican State committee, and after that became the undisputed leader of his party in Pennsylvania. In national politics he was a member of the Republican national committee after 1885, and in 1888 was its chairman, conducting a successful presidential campaign. In 1887 he was elected United States Senator, serving continuously till 1899; in that year a deadlock in the legislature prevented his reelection. This was in part owing to the fact that in 1898, on the failure of the People's Bank where State funds were deposited, he had been accused of being party to a conspiracy for the misappropriation of public funds; the trial occurred in April 1899 and resulted in his acquittal. He was then appointed Senator *ad interim* by the governor and elected to the Senate in 1901 for the term expiring in 1905. In the Senate he was one of the strongest opponents of the Panama Canal. His power as a political organizer lay chiefly in his adroit methods of reconciling opposing factions and hostile interests. A striking example of this was his method of meeting the reform movement of 1902 by supporting as candidates for governor of the State and mayor of Philadelphia, men who were endorsed by the reformers and not prominent in the regular Republican organization, thus gaining the support of what might have been a dangerous opposition.

**QUAY**, an artificial landing-place on a water-course or harbor, usually of stone. It differs from a wharf, which is a structure built out from the shore on piles, whereas a quay is properly solid. See WHARVES and WHARF CONSTRUCTION.

**QUAYLE**, kwāl, **William Alfred**, American Methodist clergyman and author: b. Missouri, 1860. He was graduated from Baker University, Baldwin, Kan., in 1885, was ordained to the Methodist ministry the next year and has since held prominent pastorates in Kansas City and Indianapolis. He was professor of Greek at Baker University, 1855–90 and president of that institution, 1890–92. In 1908 he was created a bishop. He has lectured widely and has published 'The Poet's Poet and Other Essays' (1897); 'A Hero and Some Other Folk' (1899); 'The Blessed Life' (1900); 'The Gentleman in Literature' (1902); 'The Prairie and the Sea' (1905); 'God's Calendar' (1907); 'The Song of Songs' (1910); 'The Climb to God' (1913); 'Beside Lake Beautiful' (1914); 'Recovered Yesterdays in Literature' (1916), etc.

**QUEBEC**, kwē-bĕk (Fr. ké-bĕk), one of the provinces of Canada, the largest in area and second in population, in British North America. Its capital is the city of Quebec.

**Boundaries and Extent.**— It is bounded on the north by Hudson Bay and Strait, on the east by Labrador and the Gulf of Saint Lawrence, on the south by the Bay of Chaleurs, New Brunswick and the States of Maine, New Hampshire, Vermont and New York and on the west and southwest by the province of Ontario. Its length is nearly 1,000 miles on a due east and west course, its breadth from north to south 1,200 miles and its area 706,834 square miles (15,969 water). The annexation in 1912 of the district of Ungava (354,000 square miles), now called New Quebec, has doubled its area. It thus embraces nearly one-fifth of the total area of the Dominion. The surface of Old Quebec is varied and very picturesque, embracing several ranges of mountains and lofty hills, diversified by numerous rivers, lakes and forests.

**Mountains.**— The Notre-Dame, or Green, Mountains, a continuation of the Appalachian Range, extend along nearly the whole of the south side of the Saint Lawrence. That chain runs at varying short distances from the river, and, after crossing the frontier and the State of Vermont, joins the Alleghanies.. The highest altitude reached in the province is Mount Logan in Matane County (3,708 feet). The Laurentian Mountains skirt the northern bank of the same river and the Ottawa, somewhere near and somewhere at a distance of 10, 15 or 30 miles from the banks; but 130 miles west of Montreal, cross the Ottawa and curve in the direction of Kingston, whence they run westward to the shores of lakes Superior and Huron.

**Rivers, Lakes and Islands.**— Quebec abounds in large rivers, bays and lakes. The Saint Lawrence, 1,900 miles to the head of Lake Saint Louis and navigable for large ocean-going ships as far as Montreal, flows through almost the entire length of the province, receiving, a short distance above Montreal, the waters of the Ottawa, a river 685 miles in length. That last river is more abundant in water than the Nile and the Rhine and has large tributaries, the rivers Gatineau and Lièvre (Hare), which are over 200 miles long and three others extending over 100 miles to the north. The Saint Maurice, which rises in Lake Oskelaneo and empties into the Saint Lawrence at Three Rivers, is over 325 miles in length and is remarkable for its enormous flow of water and its falls. The principal, named Shawenegan, Grand 'Mère, La Tuque, Les Piles, are wonderful water powers, 150,000 horse power now having been developed. Large pulp mills and paper factories have been erected at Grand 'Mère and at Shawenegan, a few years ago and are now the centre of large and progressive towns. The rivers Batiscan, Sainte Anne, Jacques Cartier and Montmorency, the last named famous for its falls, also enter the Saint Lawrence from the north. The Saguenay (405 miles) rising in Lake Saint John and flowing into the Saint Lawrence at Tadousac, is one of the most remarkable bodies of water in the world, varying in depth from 100 to 1,000 feet. It is the great outlet of the Lake Saint John, into which flow six long rivers; the principal one (the Peribonca) is 400 miles long and navigable for 30 miles. The Richelieu, draining Lake Champlain, discharges into the Saint Lawrence from the south and so do the Saint Francis, Chaudière, Chateauguay, Yamaska, Etchemin, Bécancour and from the north, Assumption, Matawan and du Loup. The rivers of New Quebec include the Big Nottaway, Rupert, Eastmain, Great Whale and Hamilton rivers. The principal lakes in the province are Melville (1,298 square miles), Mistassini (975), Payne (747), Saint John (350). At three places the Saint Lawrence enlarges and forms lakes, named Saint Francis, the Saint Louis and the Saint Pierre. The principal islands in the river Saint Lawrence are the islands of Montreal, of Orleans, near Quebec, Anticosti and the Magdalen Islands, situated in the Gulf of Saint Lawrence, 50 miles north of Prince Edward Island.

**Forests.**— The province of Quebec abounds in forest lands, which extend to nearly 100,000 square miles, and the numberless rivers and their branches make the handling of lumber extremely easy. The territory on the north side of the Saint Lawrence River is covered with forests which are to all practical purposes valueless owing to the abundance of small growth. Along the river Manicouagan and the Gulf and river Saint Lawrence, the timber is not only of good quality but grows in great quantity, including even scattering pine of value. Extending westward from the Manicouagan to the eastern watershed of the Gatineau, pine of the best quality is found and lumbering has been successfully carried on for a number of years. In the district from which the Saguenay and its branches draw their waters is a vast quantity of pine, spruce, larch and other woods. In the district drained by the Saint Maurice and its tributaries pine and spruce are most abundant.

In the Lower Ottawa region, including the vacant and waste lands of the Crown on the northern tributaries of the Lower Ottawa and embracing the valleys of the rivers Assumption, Dunord, Petite Nation, the Blanche and du Lièvre, in all 11,256 square miles, are to be found poplar, white and red pine, spruce, tamarack and birch. In the Upper Ottawa territory is a great pine-growing district, but, while it is more valuable than the forests of the southern part of the province, it has not been worked to the same extent as that part, where the marvelous growth of brown birch, cedar, walnut, maple and pine has been a valuable source of income. Scattered throughout the province are to be found elm, beech, ash and cherry trees. About 175,000 square miles have been set apart as forest reserves. It is estimated that the forests of the province still contain 50,000,000,000 feet of standing pine. The value of the lumber cut was (1916) $13,722,883, and of pulpwood production $6,840,489. Since 1911 the exportation of unmanufactured timber has been forbidden and the result has been the creation of a valuable pulp-wood industry.

**Mines.**— There is no coal in the province. The Laurentian formation, in the central portion of the province, holds thick beds of limestone and iron ore,— titanic and magnetic, phosphate, plombagine, mica and large deposits of graphite. Farther west the Laurentian formation is succeeded by the Potsdam sandstone. On this rests a dolmitic limestone and the limestone of the Lower Silurian Age, known as the Chazy and Trenton groups, are affording the best building stone of the province. There are many other minerals in the province of Quebec; but a few of them only are worked, namely, asbestos, ochre, chrome, copper, lead, silver and gold. There were 8,263 workers employed in the mining industry in 1916, the value of production for that year being $13,070,566, an increase of 14 per cent over the preceding year. Of the total the products of the mines are valued at $7,982,430, and building materials at $5,088,136; the former show an increase of 52.8 per cent; and the latter a decrease of 18.5 per cent. The values of the principal products were: asbestos, $5,182,205; cement, $2,525,841; copper and sulphur ore, $1,273,724; brick, $742,163; magnesite, $525,966; chromite, $299,070. The Quyon mine, opened April 1916, and from which shipments were in that year made of the value of $129,267, is probably the largest producer of molybdenite in America.

**Climate.**— The cold in Quebec in winter is generally steady; the thermometer often registers 20° below zero and the snow falling to a great depth lies on the ground from November until April. The extreme heat of summer, which is generally warm and pleasant, is indicated at 90°. But it is only exceptional that it runs up to that figure. Autumn, which lasts six or eight weeks, is the finest season of the year.

**Agriculture.**— Vegetation develops rapidly; there is a rich and loamy soil in much of the country. In the large valleys of the Saint Lawrence, of the Ottawa River, of the Matapedia, of the Richelieu, in the whole region of Lake Saint John, and in the eastern townships of the province, farming is the chief industry. The principal crops are wheat, barley, oats, rye, peas, buckwheat, potatoes clover, hay and corn. The lands lying in the vicinity of the State of Vermont are given to stock raising to a greater extent than to farming, and dairying has become an important branch of the trade of that district. In 1916 there were 660 butter factories, 885 cheese factories and 445 combined cheese and butter factories, the products having a total value of $22,761,252. In the stock-raising districts horse and cattle breeding has assumed the most important position, while sheep and swine are also raised to a great extent. Quebec had (1917) 379,276 horses, 91,102 milch cows, 958,010 other cattle, 849,148 sheep and 712,0877 swine. The total area under field crops in 1916 was 4,590,200 acres and the value $102,937,300 The following are some of the details:

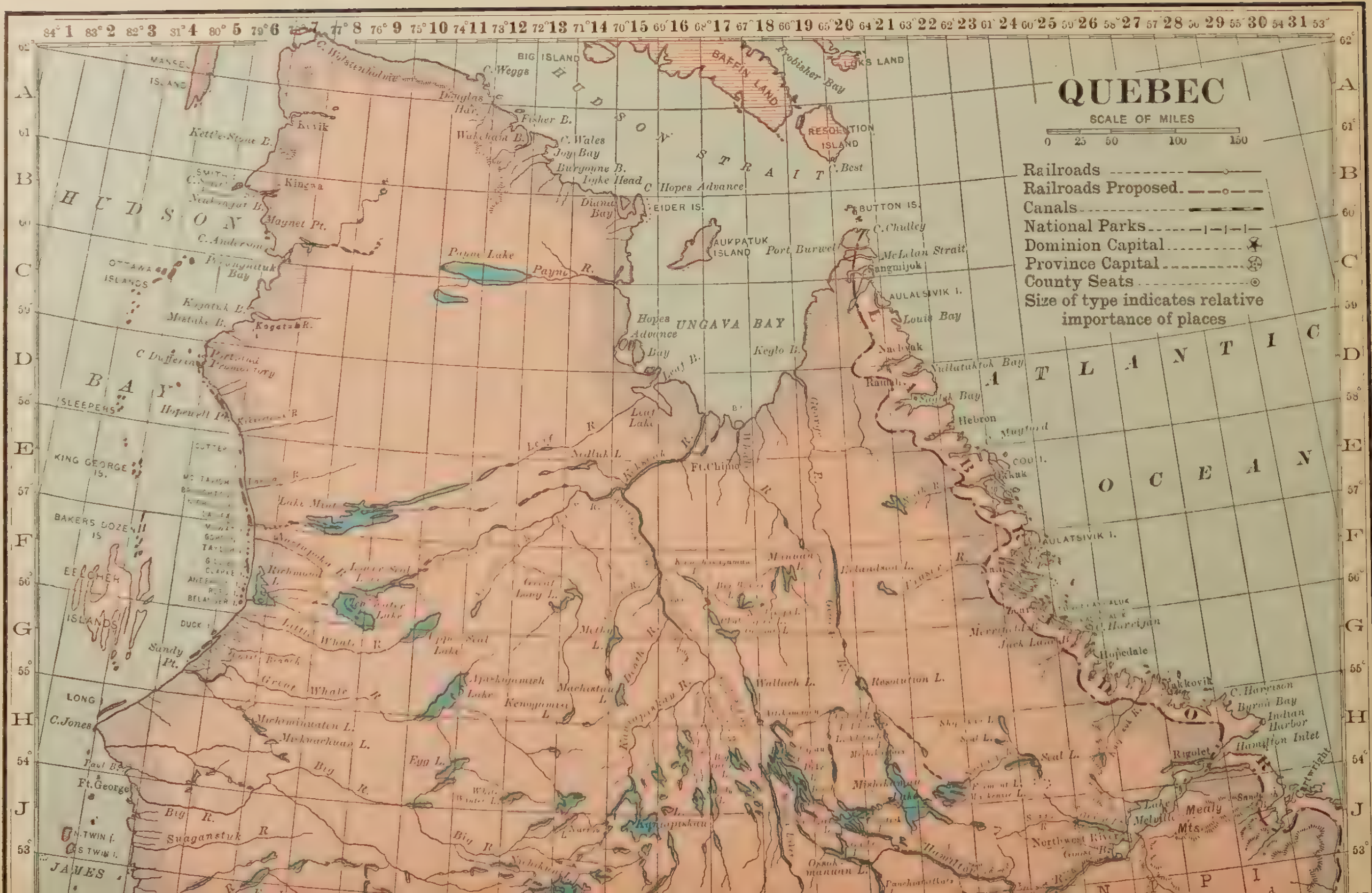
The field crops in 1916 totaled $102,937,300 in value and were as follows:

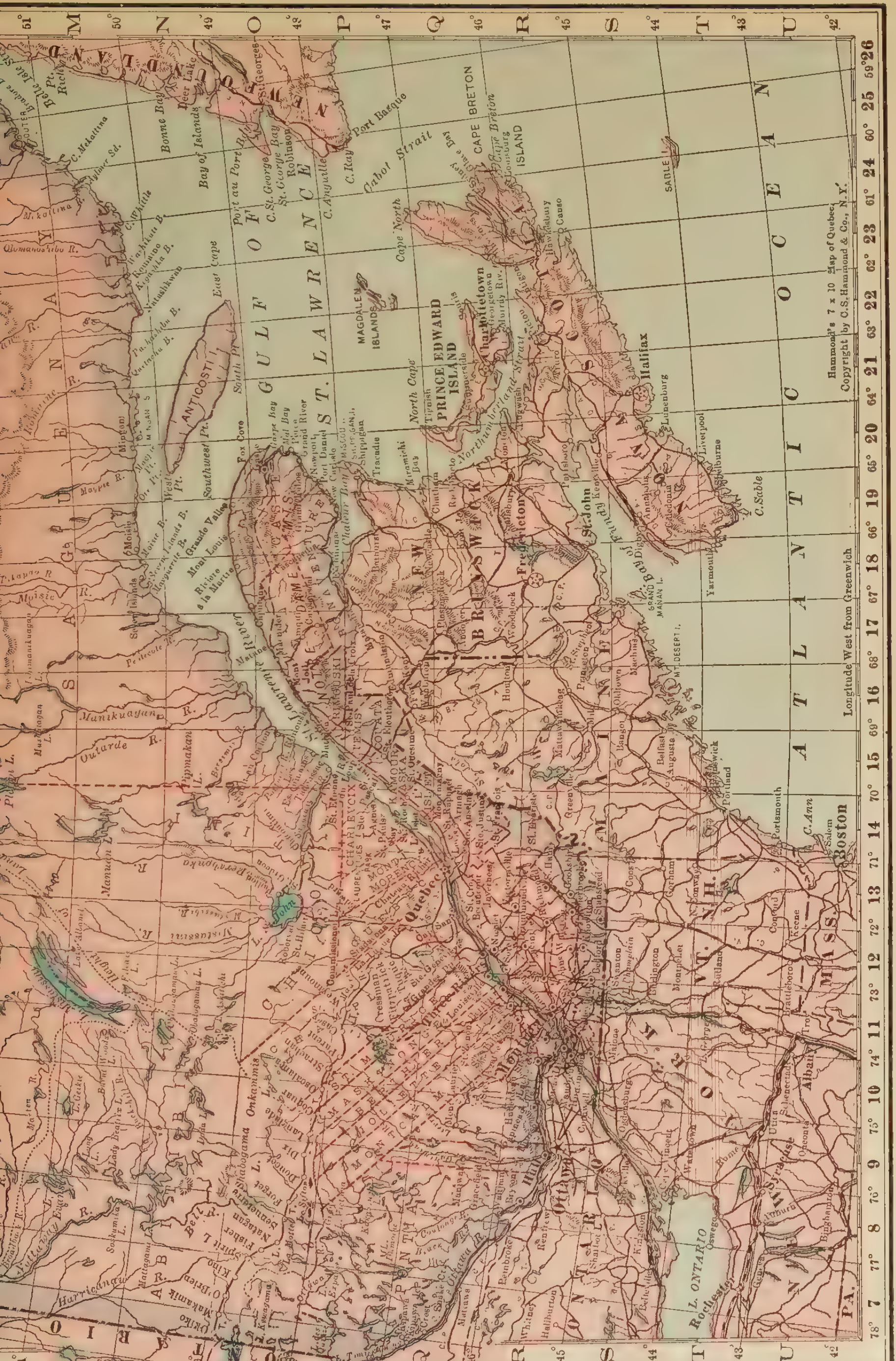
| PRODUCT | Area in acres | Total yield, bushels | Total value |
|---|---|---|---|
| Spring wheat...... | 64,000 | 960,000 | $1,786,000 |
| Oats ........... | 1,073,000 | 24,411,000 | 18,796,000 |
| Buckwheat......... | 101,000 | 1,919,000 | 2,322,000 |
| Mixed grains...... | 91,000 | 1,843,000 | 1,825,000 |
| Potatoes ......... | 112,000 | 14,672,000 | 14,232,000 |
| Turnips .... ..... | 10,000 | 2,650,000 | 1,272,000 |
| Hay and clover.... | 2,985,000 | 5,224,000 | 57,464,000 |
| Fodder corn....... | 31,000 | 248,000 | 1,426,000 |

**Fisheries.**— The total value of the fisheries of the province was in 1916 $2,076,851, and gave employment to nearly 9,000 men.

**Trade and Commerce.**— The value of the imports entered for home consumption by the province for the year ending 31 March 1917 was $270,024,440 and exports $551,111,934. Quebec has about 800 bank branches with clearing houses at Montreal, Quebec and Sherbrooke. Quebec has 7,158 manufacturing establishments, with capital of $549,000,000; 141,000 employees, and annual products worth $351,000,000. There are 2,064 vessels owned in the province of an aggregate tonnage of 123,052 tons. The annual receipts of the province are over $9,500,000.

**Education.**— Educational matters in the province of Quebec are under control of a


QUEBEC
SCALE OF MILES
0 25 50 100 150
Railroads
Railroads Proposed
Canals
National Parks
Dominion Capital
Province Capital
County Seats
Size of type indicates relative importance of places
HUDSON STRAIT
HUDSON BAY
UNGAVA BAY
ATLANTIC OCEAN
BAFFIN LAND
Frobisher Bay
RESOLUTION ISLAND
BIG ISLAND
MANSEL ISLAND
OTTAWA ISLANDS
SLEEPERS
KING GEORGE IS.
BAKERS DOZEN IS.
BELCHER ISLANDS
AUKPATUK ISLAND
BUTTON IS.
EIDER IS.
AULATSIVIK I.
C. Wolstenholme
C. Weggs
C. Chidley
C. Jones
Port Burwell
Ft. Chimo
Ft. George
Hebron
Nachvak
Hopedale
Rigolet
Payne Lake
Payne R.
Lake Minto
Clearwater Lake
Mealy Mts.
Hamilton Inlet
JAMES


Hammond's 7 x 10 Map of Quebec
Copyright by C.S. Hammond & Co., N.Y.
Longitude West from Greenwich
ATLANTIC OCEAN
GULF OF ST. LAWRENCE
NEWFOUNDLAND
ANTICOSTI I.
MAGDALEN ISLANDS
PRINCE EDWARD ISLAND
CAPE BRETON ISLAND
NOVA SCOTIA
NEW BRUNSWICK
MAINE
VT.
N.H.
MASS.
NEW YORK
PA.
ONTARIO
L. ONTARIO
Cabot Strait
Northumberland Strait
Bay of Fundy
Quebec
Montreal
Ottawa
Three Rivers
Halifax
St. John
Fredericton
Charlottetown
Boston
Albany
Portland
Sable I.
C. Sable
Cape North
North Cape
Port Basque
Bay of Islands
Bonne Bay
Gaspe
Rimouski
L. St. John

superintendent of public instruction assisted by a council and divided into committees for the management of Roman Catholic and Protestant schools, respectively. Compulsory school age is from 5 to 16 years. The schools are maintained partly by local taxation and partly by government grants and are individually controlled by local boards. There are in the province 5,988 elementary schools and 721 model schools. In the elementary schools there are 252,000 pupils. The total number of schools, universities and colleges in the province is given at 7,156, teachers 16,634, pupils 470,839. Chief among the higher institutions of learning are Laval University at Quebec and McGill University and the Presbyterian College at Montreal.

**Government.**— The system of government established in Canada under the Union Act of 1867 is a federal union having a general or central government controlling matters essential to the general development, the permanency and the union of the whole Dominion and a number of provincial organizations, each governed by a lieutenant governor, nominated and removable by the government of the Dominion and advised by a council responsible to the people's representatives and with a legislature composed in Quebec of two houses — a council of 24 members appointed by the Crown, each representing a special territorial division and an elective assembly of 81 members. The Parliament of Canada consists of a Senate and a House of Commons. The Senate, as at present constituted, has 81 members, 24 of whom are from Quebec. The House of Commons consists at present of 234 members, the basis of representation, fixed under the provisions of the Act of Confederation, being that the province of Quebec is always to have 65 representatives and each of the other provinces such a number as will give the same proportion of representatives to its population as the number 65 bears to the population of Quebec as ascertained by a decennial census. In the province of Quebec the qualifications for the electoral franchise are ownership or occupancy of real property; position as teachers or clergymen after five months' domicile in electoral district; income or personal property of specified amount — real, or real and personal, valued at $300, $200 and $100 (fishermen). Income, renters, $100; others, $300. Absentees in the United States may vote if they have returned with their families and have resided in an electoral district one month before election. Voting in elections is by ballot. No property qualification is demanded from a member of the Commons, nor is he limited to a residence in the district for which he is elected. Hotel bars within the province were closed from 1 May 1918; and from 1 May 1919, no further licenses for the sale of intoxicating liquor were to be issued.

**Municipal Institutions.**— The municipal organization of the province comprises townships, counties, being rural districts of no definite area, parishes, villages with a population of over 40 families, towns and cities erected by legislative authority. No definite figure of population is requested. The townships, parishes, towns and villages are administered by a mayor and councillors; the cities by a mayor, councillors and aldermen.

**Judiciary.**— The judiciary of the province consists of appeal (King's Bench), superior, circuit and district courts. The Superior Court and King's Bench judges are appointed by the governor-general in council. Appeal can be had from superior courts to King's Bench, and from King's Bench to the Supreme Court of Canada presided over by a chief justice and five associate judges. Final appeal, except in criminal cases, lies, by leave, to the judicial committee of the Privy Council of England. Police magistrates and justices of the peace, appointed by the provincial government, also have their place in the administration of justice.

**Crown Lands.**— The crown lands of the province not yet settled form an area of nearly 200,000,000 acres, of which about 75,000,000 are available for settlement and 7,000,000 acres have been surveyed, and are controlled by the government and administered by the minister of crown lands. They are sold at from 20 to 60 cents an acre, and the purchaser is required to take possession of the land within six months of the date of the sale, to occupy it during two years, and to fulfil various other obligations stipulated in the deed of sale.

**Population.**— The population of the province in 1911 was 2,003,232 (1916 estimate 2,309,427), almost equally divided into rural and urban, and giving an average density of 5.69 persons per square mile. Roman Catholics comprise 86 per cent of the population, which is 80.5 per cent French and 19.5 per cent English speaking. Of the French-speaking wage-earners, 36 per cent are engaged in agriculture and 24 per cent in manufacturing and mechanical industries. The numerous churches, colleges and convents of the province attest at every turn the wealth and power of the Church, and the tourist finds the whole land practically parceled out among its faithful, as far as concerns the nomenclature of the settlements and villages.

Twenty miles east of the city of Quebec, on the banks of the Saint Lawrence, is the church of Sainte Anne de Beaupré, more particularly known as La Bonne Sainte Anne, who for two centuries has won fame in Canada for miraculous cures. This historic place rests on a little plateau under the shelter of a lofty mountain of the Laurentides, and consists of a straggling street of wooden houses, with steep roofs and projecting eaves. Here one will see, on the fête of Sainte Anne and at other fixed times, a mass of people from every part of Canada, as well as from the United States. A handsome gray stone church attests the faith of the thousands who in past years have offered their supplications at the shrine of La Bonne Sainte Anne. Piles of crutches are deposited in every available corner, as so many votive offerings from the countless cripples who have been cured or relieved. The relic through which all the cures are said to be effective consists of a part of the finger-bone of Sainte Anne, which was sent in 1668 by the Chapter of Carcassone to Monseigneur de Laval.

**The Country Life.**— The situation of many of the villages of Quebec is exceedingly picturesque when they nestle in some nook by the side of the river or bay, or overlook from some hill a noble panorama of land and water. The spire of the stone church rises generally from the midst of the houses, always making the most conspicuous object in the surrounding landscape. The houses are, for the most part, built of wood. The roofs are often curved, with projecting eaves, which afford a sort of veranda, under which the family sit in summer evenings. Some of the more pretentious structures, especially the inns, have balconies running across the upper story. Many of the barns and outhouses have thatched roofs, which are never seen in any other part of Canada. The interiors are very plainly furnished, in many cases with chairs and tables of native manufacture. A high iron stove is the most important feature of every dwelling in a country where the cold of winter is so extreme. Whitewash is freely used inside and outside, and there is, on the whole, an air of cleanliness and comfort in the humblest cottage. No class of the population of Canada is more orderly or less disposed to crime. Early marriages have always been encouraged by the priests, and large families are the rule in the villages. The temperate habits of the people make them valuable employees in mills and manufactories of all kinds, and until a recent period there was a steady exodus from the province to the manufacturing towns of New England. A large proportion of the men employed in the lumbering industry of Canada is also drawn from the province of Quebec. In commercial and financial enterprises, however, the French Canadians cannot compete with their fellow citizens of British origin, who practically control the great commercial undertakings and banking institutions of Quebec, especially in Montreal. But they are remarkably progressing in that line. Nor, as a rule, could they compare formerly with the English population as agriculturists. But they have largely improved their methods of farming, and they have established in every parish, butter and cheese factories. The French population also had less enterprise and less disposition to innovations. But they do adopt new machines and improved agricultural implements like the people of the other provinces of Canada.

**Literature.**— In times past there was no native literature, and little general culture, except in small select circles at Quebec and at Montreal; but during the past half-century, with the increase of population, the establishment of colleges and universities, the dissemination throughout of classical education, and the development of self-government, the French Canadians have created for themselves a literature, which shows that they inherit much of the spirituality and brilliancy of their race. The histories and poems have attracted much attention in France, and some of their literary works have been awarded prizes by the French Academy. In history mention should be made of the names of Garneau, Ferland, Sulte, Tassé, Turcotte, Dionne, Casgrain, Gosselin, Le Moine, Gagnon, Myrand, etc.; in poetry, Cremazie, Chauveau, Frechette, Poisson, Lemay, Chapman and many others; in science, Hamel, Laflamme, De Foville, etc. In art some progress has been made, and young men go to the Paris schools from time to time. The only sculptor of original merit that Canada has yet produced is Hébert, a native of Quebec, whose statues of eminent Canadians stand in several places. Science has not made as much progress as belles-lettres and history, though Laval University has among its professors men who have done creditable work in mathematics, geology, chemistry and physics. In romance, however, little has been done, except by Marmette, Lemay and a few others.

**History.**— Jacques Cartier discovered and explored the river Saint Lawrence in 1533, but it was not until 1608 that Samuel de Champlain founded the present city of Quebec, which, at the end of 12 years, had a population of only 60 persons. The Récollets were the first missionaries. The Jesuits came to the settlement in 1625, and thereafter played a leading part in its history. Montreal was founded in 1642 by Maisonneuve; but for many years as an agricultural or commercial settlement, New France, as it was called, remained a failure, its only trade being the fur trade. A change came under Louis XIV, when a systematic effort began to make the colony the starting point of a French and Catholic empire which should embrace the whole of the continent. The result of this policy was a long contest between the two races, which began in 1689 with the second advent of Count Frontenac as governor of New France, and ended in 1759 with the capture of Quebec by a British army under Wolfe. The capitulation of Montreal in 1760 completed the English conquest of Canada, which, with all its dependencies, was in 1763 formally ceded to the British Crown.

The policy of the conquerors toward New France was, from the appointment of General Murray, a liberal one, and in 1774 took definite form in what was known as the Quebec Act, by which the British Parliament assured the French Canadians the free exercise of their religion, the enjoyment of their civil rights and the protection of their own civil laws and customs. The act also annexed larger territories to the province of Quebec, and provided for a governing council partly composed of Catholics, and for the administration of the criminal laws as in use in England. There was, however, constant strife between the conquering and the conquered race, the object of which was to amalgamate the two races, and to put an end to it, Parliament, in 1791, divided Canada into two provinces — Lower Canada, or Quebec, for the French, and Upper Canada (now Ontario) for the British, many of whom had fled thence from the United States at the close of the Revolutionary War. Each province was to have, besides the governor who represented the Crown, a legislative council nominated by the Crown, and an assembly elected by the people for four years. But the two races were not separated by the division of the province, and in 1841, after a long and stormy agitation, a reunion of the provinces was effected under the name of the Province of Canada, and with it the establishment of responsible government. The legislature consisted of a council and assembly, each province being represented in the assembly by 42 members, 84 in all, elected by the people; and the council numbered 20 members, appointed by the Crown. This arrangement lasted until 1867, when it gave way to a union of the provinces of British North America. The way for confederation was cleared by a convention of representatives of all the provinces, held in Quebec, in October

1864, which unanimously adopted a set of resolutions embodying the conditions on which the provinces, through their delegates, agreed to a federal union. These resolutions were duly laid before the various legislatures and adopted in the shape of addresses to the Queen, whose sanction was necessary to embody the wishes of the provinces in an imperial statute; and in February 1867 the British North America Act was passed by Parliament. On 1 July of the same year the union of the provinces of Canada, Nova Scotia and New Brunswick was proclaimed under the name of the Dominion of Canada, the names of Upper and Lower Canada being changed at the same time to Ontario and Quebec.

Adolphe B. Routhier,
*President of the Court of Admiralty for the Province of Quebec.*

**QUEBEC**, founded by Samuel Champlain in 1608, is the seat of the Provincial Government. It is situated on the northeastern end of a narrow promontory, which is bounded to the southward by the river Saint Lawrence, and to the northward by the valley of the Saint Charles. The cliffs on the Saint Lawrence side run up the river for many miles, and average between 200 and 300 feet in height. The earliest buildings were constructed along the narrow shore at the foot of Cape Diamond, and gradually extended to what is now the lower town. In the course of time Champlain transferred his residence to the summit of the rock, and soon other buildings arose which marked the beginnings of the upper town. In a few places in the lower town a part of the river bed has been reclaimed, particularly near the old palace of the Intendants; but with these exceptions the streets follow the original plan. Winding roads, cut out of the rock, and flights of steps, lead from the lower to the upper town, the streets of which bear the names originally given to them. Quebec claims the distinction of being the one walled city of the north, and although the march of progress has introduced many innovations, it has been powerless to destroy the impress of the founder. At the time of the death of Champlain, in 1635, the entire population of Quebec was only 80 persons. But shortly after, as a result of the circulation of the «Relations» of the Jesuits in the mother country, an effort was made to colonize New France. The first fruits of this movement were the establishment of the Ursuline Convent and the Hotel Dieu, in 1639. These two institutions, which have ever since exercised a beneficent influence, were founded by the zeal of two noble women, Madame de la Peltrie and Madame d'Aiguillon, whose names are consecrated in the pages of Canadian history. The Ursuline Convent has continued to be the centre of education for the girls of Quebec, both French and English. In this institution, the Old World and the New run side by side. The rule of the order is the same as in 1639. In the nave of the convent chapel repose the remains of the Marquis de Montcalm; and in the Chapel of the Saints, through all the startling changes of two centuries, the Votive Lamp, first trimmed by Marie Repentigny in the days of the French régime, is still kept steadfastly burning. The Seminary of Quebec founded in 1668, is another institution in which the customs of the Old World are preserved. From the Seminary sprang the famous Laval University, the chief seat of learning in the province for the French population.

From the earliest times Quebec has been fortified. In 1535, Jacques Cartier built a rude fort at the mouth of the river Lairet, and in 1608 the «Habitation» constructed near the site of the present Champlain Market, was mounted with cannon to protect the inhabitants against the incursions of the Indians. Twenty years after a fort was erected on the crest of the rock, which served as a residence for the invader Kertk until 1632. Frontenac put into execution the first scheme for enclosing the town with a wall, but like all the French works of defense, the profit of the contractor was of more importance than the solidity of the workmanship. In 1720, a new scheme was undertaken. Large sums of money were expended from year to year, but when Wolfe came before Quebec in 1759, the foot of rotten walls could be seen 500 yards off. After the battle of the Plains, temporary works were constructed in front of the old walls. In 1783 a temporary citadel was commenced beyond the line of fortification, and the remains of these works, still visible, are erroneously referred to in local guide books and maps, as of French origin. In 1823 the British government undertook a comprehensive scheme of defense, the main parts of which are in excellent repair to-day. The picturesque old gates have been demolished, and in two instances, arches in keeping with the walls have replaced them, and the Martello Towers, overlooking the Plains of Abraham, stand as originally built. The Fortress of Quebec comprises the citadel on Cape Diamond, where the governor general's quarters are situated, the town lines, and the forts on Levis Heights. The citadel is garrisoned by the Royal Canadian artillery.

Quebec has nine parish churches belonging to the Catholics, four others in the charge of chaplains, and 13 chapels attached to religious communities, open to the public. The Church of England is represented by the English Cathedral and six churches, while the Methodists, the Presbyterians and the Baptists have each separate places of worship. The first parish church was erected in 1633 under the name of Notre Dame de la Recouvrance; but it was destroyed in 1640. In 1647 the French cathedral was commenced under the name of Notre Dame de la Paix, in commemoration of the peace concluded with the Iroquois. It was opened in 1650. The pillars of the present church date from 1647, the towers from 1684 and the remainder of the building from 1745. The paintings in the cathedral brought from France are very valuable and there are many costly vestments of an early date. Notre Dame des Victoires, in the lower town, was commenced in 1688 under the name of Notre Dame de la Victoire. After Phips besieged Quebec in 1690, a pilgrimage to the church was organized, and in 1711, on the destruction of Walker's fleet off Egg Island, the name of Notre Dame de la Victoire was changed to Notre Dame des Victoires. During the siege of Quebec in 1759, only the walls were left standing. Of the modern Catholic churches the Franciscan's is the most beautiful. It was built for the perpetual adoration of the Blessed Sacrament.

After the Treaty of Paris in 1763, English services were held by the Protestants in the church of the Récollets. The drum was beaten at half past 10 for the Mass of the Récollets, at the conclusion of which the fathers tolled the bell for the English service. The English cathedral, situated on the site of the Récollet Church, was commenced in 1804. The paintings in the archbishop's palace, and in the Ursuline Convent and Laval University, are amongst the most valuable in Canada. In the governor's garden is a monument which always appeals to strangers. It is a plain granite column. On one side it bears the name of «Wolfe,» and on the other the name of «Montcalm,» and on the base this simple inscription:

Mortem virtus communem
Famam Historia
Monumentum Posteritas
Dedit.

It is the only instance on this continent of a common monument to the victor and the vanquished. Near the jail is the monument to Wolfe, with its inscription «Here died Wolfe Victorious,» and a little farther on, along the Sainte Foy Road, is the column to the memory of the French who fell in their endeavor to retake Quebec in 1760. The name of the English general, Murray, is also prominent on this column. These monuments of stone are more eloquent than words of the harmony existing between two races, mingling with each other, and still preserving their own laws, their language and their religion. In the upper and lower town markets, may be witnessed scenes typical of French Canadian habitant life, and even in the streets through which the electric cars run we may trace, at all times, the features of the French régime. The boys of the seminary still wear the long blue coat piped with white, with green sashes, as they did 200 years ago. The nuns passing to and fro in their prescribed costumes; the priests in their cassocks, the habitants in their old-fashioned vehicles or rude sleighs, look out of place in the 20th century; and yet the people of Quebec would not welcome any change. The city, however, keeps pace with the times in other respects. The streets are well paved, well lighted, always clean. All the waste places possible are converted into small gardens, and there is an excellent civic administration. The hotel accommodation, especially since the construction of the Chateau Frontenac, is the best in Canada. Laval University has a library of 125,000 volumes. The Parliament buildings and grounds, the city hall, the courthouse and other public buildings, are better than in the larger cities of Canada, and yet there is still so much which belongs to a by-gone age. The tercentenary of the founding of the city was fittingly celebrated in 1908. According to the census of 1911, the population of Quebec was 78,710 (estimate of 1916, 110,000), a very large proportion of which is composed of French.

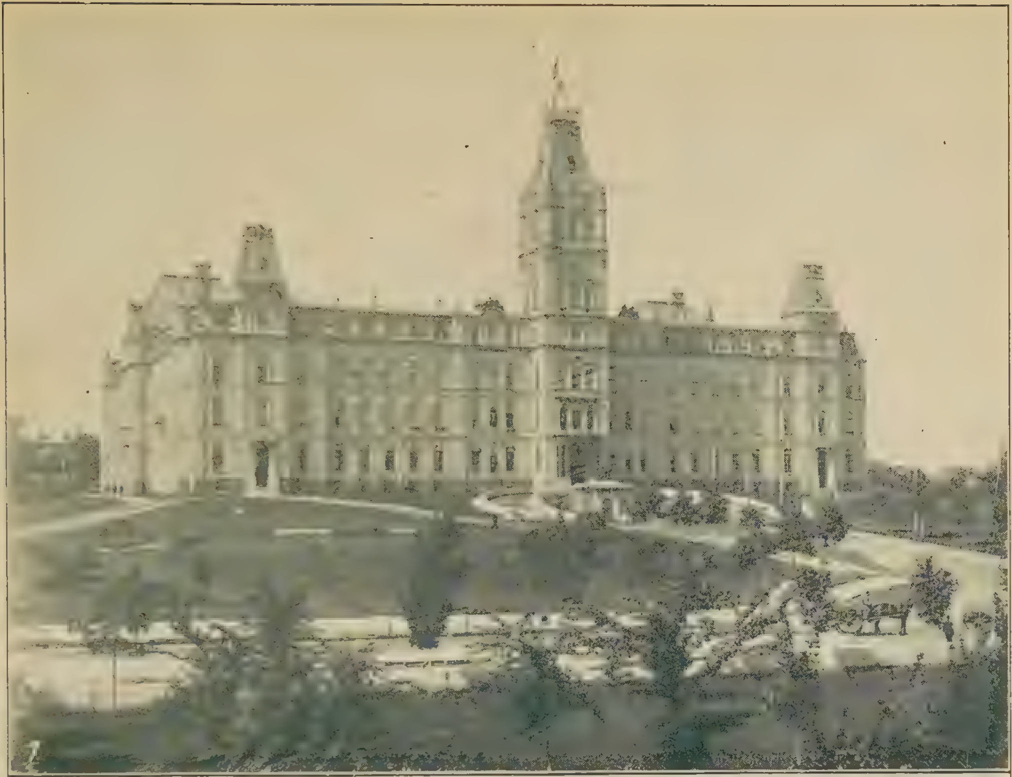
Most of the English reside in the upper town, although there is no marked division. The Grande Allée is the principal thoroughfare, and contains many fine dwellings. At one time the lumber trade flourished, and as large fortunes were amassed the wealthy merchants and traders built country seats along the Sillery Road; but they are now mostly deserted. Shipbuilding was also a great industry for many years, as very large vessels were built there, but nothing now remains. The leather and shoe trade still give employment to thousands. The commercial and financial institutions are controlled to a large extent by the English. The lower town is principally devoted to business, and the suburbs of Saint Roch and Saint Sauveur to manufacture and the dwellings of the working classes. The small arms and the ammunition for the militia are manufactured in Quebec. The port of Quebec is always active in season, and it is the landing place of immigrants; but Montreal has absorbed a great deal of the commerce. The bridge which is being built across the Saint Lawrence will bring the grain from all quarters to Quebec, and its future commercial life may assume large proportions. As the seat of government, it will always retain a prominent place, and in its immediate vicinity there are so many places of picturesque and historic interest: Wolfe's Cove; the place where the gallant Montgomery fell in 1775; the Heights of Levis; the Island of Orleans; the village of Beauport, with Montcalm's headquarters; Indian Lorette; the falls of Montmorency, with Wolfe's house; the Shrine of Sainte Anne, and the numerous places which may be reached by electric railway, the Canadian Pacific Railway, the Grand Trunk Railway, the Intercolonial Railway, the Great Northern, the Quebec and Lake Saint John, and the boats of the Canada Steamship Lines. But the perpetual charm of Quebec, apart from its magnificent situation, lies in the fact that it is the cradle of New France; that upon its lofty rock a drama was fought which decided the fate of a continent; that from its institutions, scarcely altered by the flight of three centuries, men went forth to rescue for civilization an untamed wilderness, and paved the way for the great Republic of the United States.

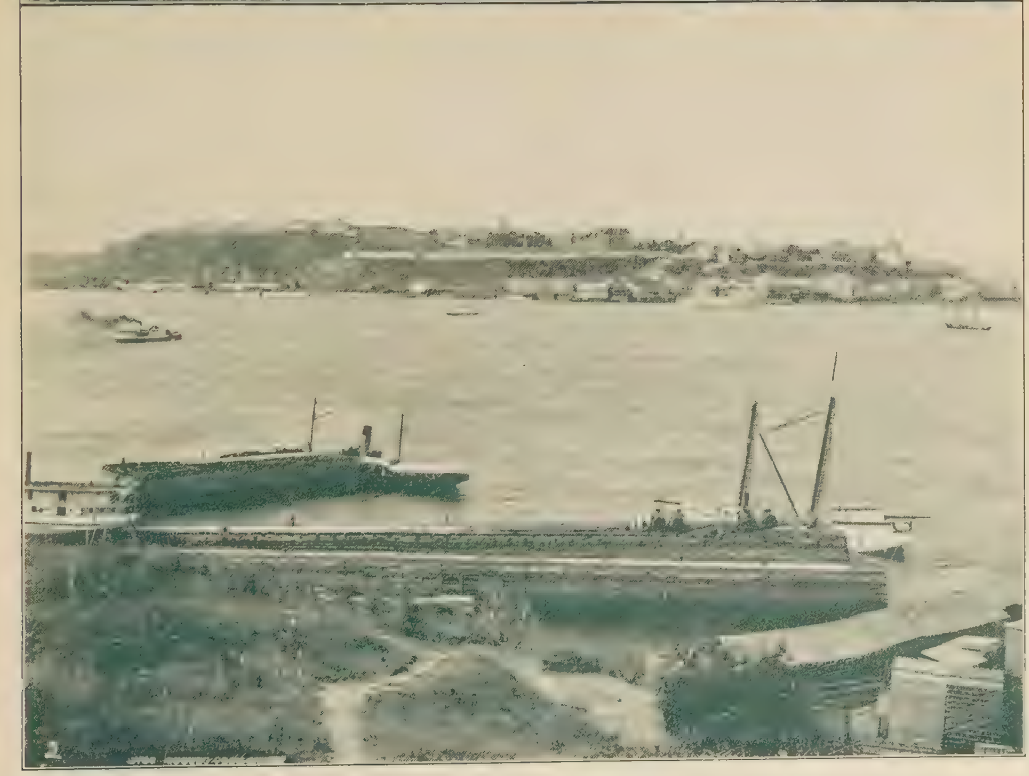
A. G. Doughty,
*Author of 'Quebec Under Two Flags.'*

**QUEBEC, Battle of.** See Colonial Wars in America.

**QUEBEC, Siege of,** in the American Revolution. After Ethan Allen and Benedict Arnold (qq.v.) had captured Ticonderoga and Crown Point (qq.v.), Continental Congress, at Washington's earnest solicitation, decided to conquer Canada as a measure of self-defense. One expedition under Gen. Philip Schuyler (q.v.) was to proceed northward by way of Lake Champlain and another under Arnold through Maine, both converging on Quebec. Schuyler sent Richard Montgomery (q.v.) in advance to reduce Saint John's, about 150 miles north of Ticonderoga, while he returned to Albany to push troops to the front. On 13 Oct. 1775 a small British fort at Chamblet was captured but to offset this Sir Guy Carleton (q.v.), British commander at Montreal, captured Allen and a band of 80 men who, without consulting Montgomery, had attempted to surprise the garrison at Montreal. Allen was sent in irons to England. After an abortive attempt by Carleton to drive off the invaders, Saint John's surrendered 1 November, whereupon Carleton abandoned Montreal and fled to Quebec, Montgomery occupying Montreal 13

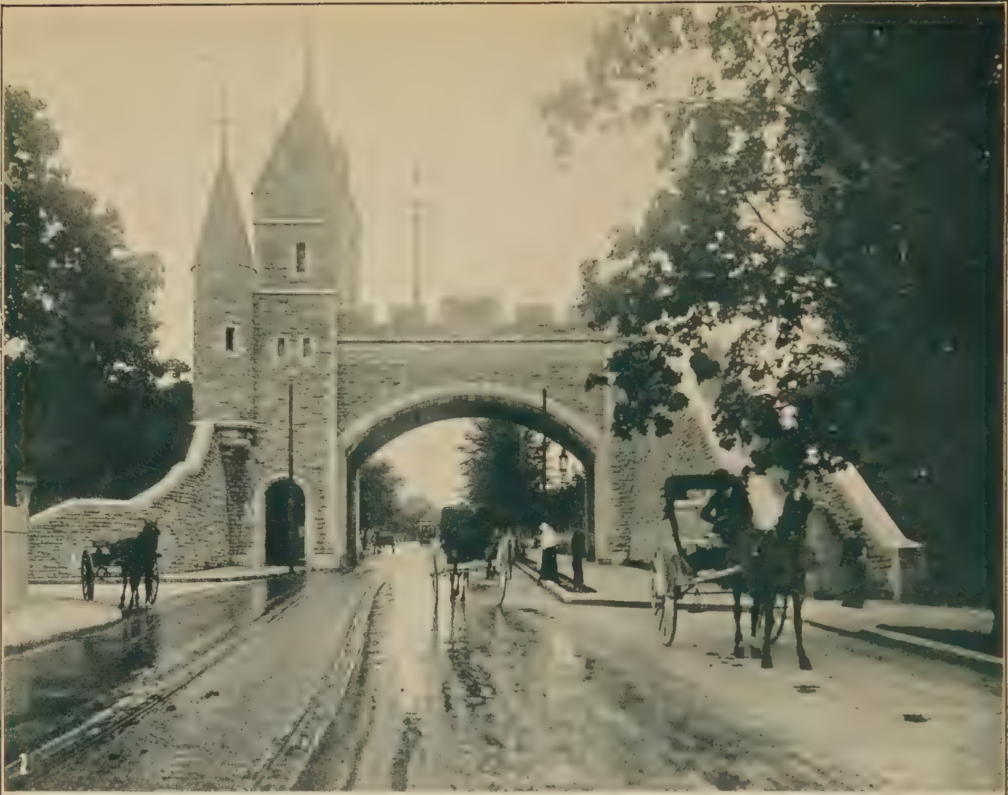
# QUEBEC, CANADA

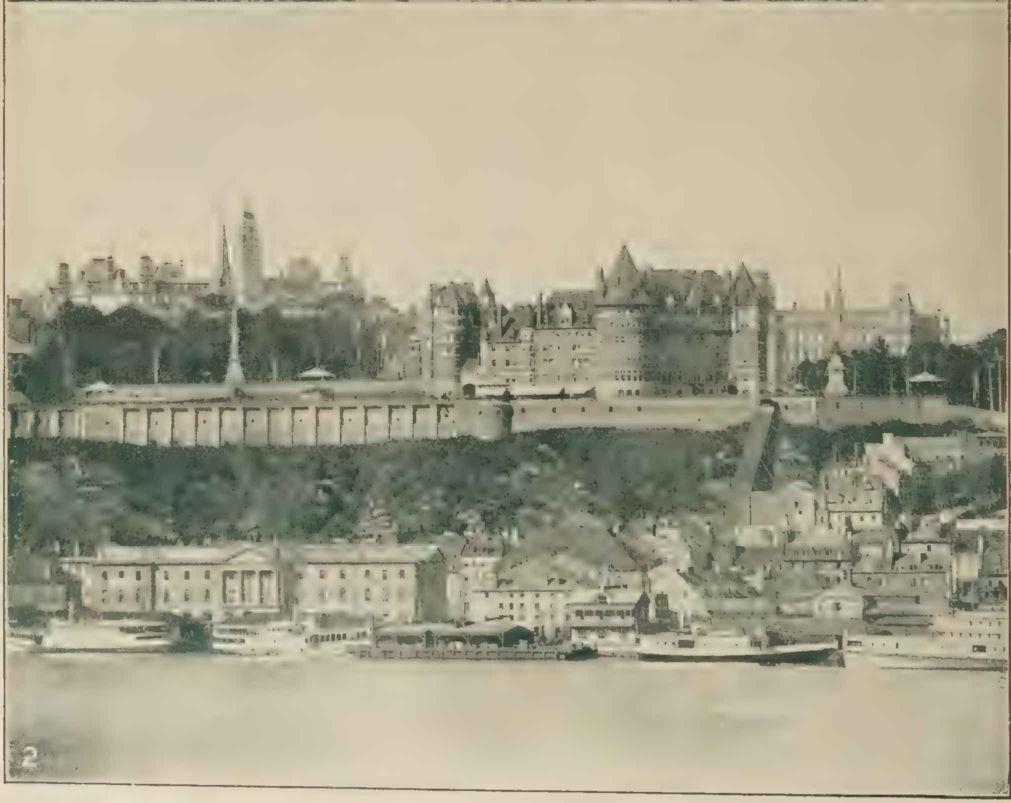




1 Parliament Buildings

2 City of Quebec, from Levis





1 St. Louis Gate and the Grand Allee

2 The Chateau Frontenac, from Levis

November and later following Carleton with about 300 men.

Meanwhile, with 1,050 troops, Arnold had begun his march, reaching Point Levi, opposite Quebec, 9 Nov. 1775. On the 13th he crossed the river with his army, which had been reduced to 600 troops, occupied the heights near the Plains of Abraham, and attempted to surprise the city, but finding the garrison prepared for defense, retired to await Montgomery's arrival which occurred 1 December. The combined troops numbered 900 and, owing to the rigors of the winter march, were in an emaciated condition. For three weeks the Americans bombarded the city ramparts without effect and Montgomery decided to attempt the reduction by assault. Dividing the force, the two commanders made a simultaneous assault from different points on the night of 31 Dec. 1775. Montgomery attacked the lower town but in attempting to storm a blockhouse was killed with several others and his troops retreated. Arnold assaulted the town from his side but his leg was shattered by a ball and the command devolved upon Capt. Daniel Morgan (q.v.) who captured the first and second barriers. But when Montgomery had been repulsed, the troops from that quarter attacked Morgan on the rear and finally, after an obstinate fight, he surrendered, the prisoners numbering 426. Arnold escaped capture and, collecting his dispirited troops, maintained an imperfect blockade of the city until the spring of 1776, when he was succeeded by Gen. David Wooster (q.v.), who made several ineffectual attempts to capture the city. A large body of British troops arrived from England and the Americans were compelled to fall back on Montreal; finally on 18 June they evacuated the province, going to Crown Point. (See CHAMPLAIN, LAKE, BATTLE OF). Consult Henry, John J., 'The Siege of Quebec'; Parker, Gilbert, 'Old Quebec,' pp. 342–363; Bradley, Arthur G., 'The Making of Canada,' pp. 89-111; Carrington, H. B., 'Battles of the Revolution,' p. 120 et seq.; Codman, John, 'Arnold's Expedition to Quebec'; Smith, Justin H., 'Arnold's March from Cambridge to Quebec'; Coffin, C. C., 'The Province of Quebec and the Early American Revolution'; Arnold, I. N., 'Life of Arnold'; Thayer, 'Journal of the Expedition to Quebec' (ed. Stone); Sparks, Jared, 'Correspondence of the Revolution,' Vol. I; Lossing, B. J., 'Field-Book of the Revolution,' Vol. I; Force, Peter, 'American Archives,' 4th series, Vols. III–VI; 5th series, Vol. I; 'Massachusetts Historical Collection' 2d series, Vol. II, p. 227 et seq.; Sparks, 'Life of Arnold,' Chaps. III–IV; Fisher, S. G., 'Struggle for American Independence,' Vol. I, pp. 394–424; Smith, Justin H., 'Our Struggle for the Fourteenth Colony'; Wiley and Rines, 'The United States,' Vol. II, pp. 387–397.

**QUEBEC ACT,** the administrative measure passed by the British Parliament in 1774, for the purpose of adding the regions extending to the Ohio and Mississippi over which the French had exercised authority, to the province of Quebec, which had been limited by the Proclamation of 1763 to an area of about 100,000 square miles along the central Saint Lawrence. The act established also the body of the French customary law as the permanent civil code of the region, the introduction of English civil law among the French-speaking inhabitants having been found impracticable; it admitted also to a partial franchise the Roman Catholic population, guaranteeing them freedom of public worship, confirming them in the possession of their ancient churches and revenues, but withholding from them representative institutions, authority over this vast territory being vested in a council appointed by the executive power of Great Britain.

The act, which had for its main motives the welfare of the French Canadians and the security and unhampered progress of the colonies and of colonial trade, was viewed with indifference by the Canadians, was unpopular in England, aroused the indignation of the older American colonies and had considerable influence in directing the early course of the Revolution. To it the Declaration of Independence refers as follows: «Abolishing the free system of English laws in a neighboring province, establishing therein an arbitrary government, and enlarging its boundaries so as to render it at once an example and fit instrument for introducing the same absolute rule in these colonies.» For opposing views on the measure consult Coffin, 'The Quebec Act and the American Revolution' in *The Yale Review* (1895); Bancroft, 'History of the United States,' Vol. IV, chap. V (1884); Hart, 'The Quebec Act 1774' (1891); and McArthur, D., 'Canada under the Quebec Act' in Canada and Its Provinces (Vol. III, 1914).

**QUEBRACHO,** kĕ-brä'chō, the name given to several trees of different genera, but with similar qualities, indigenous to South America, valuable alike for their wood and their bark. The red quebracho (*Loxopterygium lorentii,* family *Anacardiaceæ*) is very hard, but splits easily. The bark and wood are used in tanning. The white quebracho (*Aspidosperma quebracho*) is used for wood-engraving. Its bark contains an alkaloid (quebrachin) and is used therapeutically as a remedy for asthma, being employed as a decoction and a tincture. Its action is to lower the action of the heart without harmful result.

**QUECHUA,** kā'chwạ. See QUICHUA.

**QUEEN,** the wife of a king, or the female sovereign of a kingdom. In Britain she is either merely a queen-consort, the king's wife, and his subject, not his equal, on an equal footing, save as provided by law, with the rest of his subjects; or she is a *queen-regent,* regnant, or sovereign, holding the crown in her own right, as did Elizabeth or Victoria. The *queen-dowager,* widow of the king, retains most of the privileges pertaining to a queen-consort. It is high treason to compass or imagine the death of a queen-consort, or to violate her person; and if the consort is consenting, she is equally guilty. Under the constitution of Sweden, Belgium and other European countries a woman cannot be queen-regent.

**QUEEN ADELAIDE ARCHIPELAGO,** belonging to Chile, at the west entrance to the Strait of Magellan; separated from the mainland by Smyth Channel. The islands are mountainous and present rugged faces to the sea. The summits of some are snow capped during the year; but the vegetation at the base is varied and for a short season luxuriant.

**QUEEN ANNE STYLE.** See Renaissance.

**QUEEN ANNE'S BOUNTY,** a fund established for the enlargement of the incomes of the holders of the poorer incumbencies in the Established Church of England, and to aid incumbents in rebuilding parsonages by granting advances of money. It was created by royal charter of Queen Anne, confirmed by act of the parliament, by which the first fruits (the whole of the first year's profits) of all spiritual preferments, and the 10th part of the annual profits of the same — both of which, prior to the reign of Henry VIII, had been paid into the papal treasury, but were then annexed to the crown — are set aside to form this perpetual fund. The fund is administered by a board of governors consisting of high ecclesiastical dignitaries, the speaker of the house of commons, privy councillors, chancellors of the universities, etc. It amounts to over $35,000,000, and the annual grants and benefactions to nearly $300,000. To encourage private benefaction, the board of governors may give $1,000 to incumbencies of not exceeding $225 a year where an equal or greater sum is voluntarily contributed.

**QUEEN ANNE'S POCKET-MELON.** See Melons.

**QUEEN ANNE'S WAR.** See Colonial Wars in America.

**QUEEN OF THE ANTILLES,** a name given to the island of Cuba on account of its size and superior natural advantages.

**QUEEN CHARLOTTE ISLANDS,** a group off the coast of Canada, belonging to the Province of British Columbia; about 100 miles from the mainland and 135 miles northwest of Vancouver Island. Area, 5,100 square miles. The largest Islands are Graham and Moresby, each about 160 miles long and 70 miles wide. The surface of Graham is rolling land; but the other islands are rugged and mountainous. Dense forests and a luxuriant growth of small plants cover the islands. Copper, anthracite coal, iron ore and gold-bearing quartz are found here; fishing is the chief occupation. The inhabitants, believed to number under 1,000, are mostly Indians.

**QUEEN CHARLOTTE SOUND,** the body of water which separates Vancouver Island (q.v.), on the north, from the mainland of Canada.

**QUEEN CITY,** or **QUEEN OF THE WEST,** names applied to Cincinnati, Ohio, on account of its commercial importance, at a time when it was larger than Chicago and Saint Louis.

**QUEEN CITY OF THE GOLDEN GATE,** a name given to San Francisco on account of the name of the strait north of the city, and also that the city was practically the gate or entrance to the gold fields of California.

**QUEEN CITY OF THE LAKES,** a name given to Buffalo, N. Y., on account of its commercial importance and its commanding position on the Great Lakes.

**QUEEN ESTHER.** See Montour, Esther.

**QUEEN MAB.** Shelley's 'Queen Mab' was written in the months of quixotic enthusiasm following the youthful poet's first marriage, and was printed for private distribution in 1813. When in 1821 a pirated edition appeared, Shelley characterized the piece as «villainous trash.» It is indeed tediously long, vapid and visionary, but it possesses, in addition to its considerable metrical interest, a good deal of value as a mirror of the author's mind at 18 and as evidence of the charm exerted upon sensitive spirits of the age by the radical philosophy of the 18th century. Copious argumentative notes indicate as sources of inspiration such writers as Godwin, Gibbon, Hume, Voltaire, Rousseau, and Locke. In his survey of history Shelley attributes most of the ills which mankind has suffered to false religion, monarchical institutions, marriage, customs, conventions and the eating of meat. In this sanguine vision of the future he represents a world regenerated through the emancipation of reason and passion, which we are to believe will lead to the abolition of priests, kings, prisons and marriage vows and to the adoption of a vegetable diet. There is little or no common sense in the composition but an abundance of intense young heady ardor for reforming society by that short method dear to the Godwinian idealist — letting every one do as he pleases, a method which in practice requires resort to the guillotine.

Stuart P. Sherman.

**QUEEN-OF-THE-MEADOW,** or **QUAKER-LADY,** a spiræa. See Meadowsweet.

**QUEEN OF THE PLAINS,** a name applied to Denver, Colo., which rests on an eminence on the western border of the Great Plain and seems to overlook the vast region of plain-land stretching off to the east.

**QUEEN'S BENCH.** See Court.

**QUEENS' COLLEGE,** Cambridge, England, founded in 1448 by Margaret of Anjou, queen of Henry VI, and refounded in 1465 by Elizabeth, queen of Edward IV, is administered by a president and 13 foundation fellows. Richard Andrew donated the site and Dokett, the first master, secured the endowment. A fixed proportion of the revenues of the college is paid to a scholarship fund. There are nine church livings in the gift of the college and one in that of the president. There are in addition four exhibitions named after their founders, and the president distributes $650 per annum in grants to deserving students of limited means. About 200 students are enrolled. The college buildings are among the most interesting in the university and include four courts of small size. In a tower in the pump-court are the rooms inhabited by Erasmus (1506). There are about 30,000 volumes in the library. John Fisher, Thomas Fuller and Bishop Pearson were members of the college. Consult Gray, J. H., 'Queens' College' (London 1899).

**QUEEN'S COLLEGE,** Oxford, England, was founded in 1340 by Robert de Eglesfield, chaplain to Philippa, queen of Edward III, for a provost and 12 scholars. The college now consists of a provost, from 14 to 16 fellows, about 25 scholars and two Bible-clerks. Six of the scholarships, annual value $400, are called Eglesfield scholarships, and are awarded to natives of Cumberland and Westmoreland. There is also a scholarship called the Jodrell scholarship, of the annual value of $450 and tenable for four years; and a considerable number of other exhibitions. The college presents to 23 church-livings. The college buildings are of the 17th century; the hall was designed by Sir Christopher Wren. Wyclif, Edward the Black Prince, Henry V, Addison, Bentham, Jeffrey, Mitford and Wycherley are numbered among its distinguished alumni. See OXFORD UNIVERSITY.

**QUEEN'S COLLEGES,** Ireland, until 1909 the names of three institutions of higher education situated at Belfast, Cork and Galway. They were chartered in 1849 in pursuance of an act of Parliament passed in 1845, granting $500,000 out of the consolidated fund for their establishment. The colleges were opened in 1850, being connected with Queen's University, then also instituted as a degree-conferring body. The corporate body of each college consisted of the president and professors, and the general government and administration was vested in a council consisting of the president and six members, elected by the professors from among themselves. In 1909 the Belfast College received a separate charter as Belfast University, while those at Cork and Galway became constituent colleges of the new National University (q.v.).

**QUEEN'S METAL.** See BRITANNIA METAL.

**QUEEN'S PIGEON,** a magnificent ground pigeon (*Goura Victoriæ*), inhabiting the islands of the Indian Ocean, named after Queen Victoria. See GOURA.

**QUEEN'S UNIVERSITY.** Queen's University, situated at Kingston on Lake Ontario, is one of the largest universities of Canada. It has faculties of arts, applied science, medicine, education and theology; and holds a yearly summer school for instruction in certain subjects in the arts and education courses. Degrees in agriculture are granted, but the final two years in this course must be taken at the Ontario Agricultural College at Guelph. The university extension department provides for instruction extra-murally in the arts course, but degrees are not granted unless a portion of the course is taken in attendance.

The university was incorporated by royal charter on 16 Oct. 1841, and on 2 March 1842 the first session opened with 11 students. Dr. Thomas Liddell, formerly minister of Lady Glenorchy's Church in Edinburgh, was the first principal. The institution was modeled on the democratic lines of the Scottish universities with a view to bringing higher education within the reach of the humblest aspirant. One of the pressing reasons for its establishment was to provide for the education of the Presbyterian clergy in Canada. As no religious tests were imposed on students, the denominational character of the institution faded into the background, and, although the university was nominally under the ægis of the Presbyterian Church, its real function became that of a great national university, drawing students of all creeds from every province of the Dominion. In 1911 the nominal relationship with the Church, which prevented the obtaining of government assistance, was formally severed by the Presbyterian General Assembly, and in April 1912 constitutional changes effected by an act of the Dominion Parliament made the university undenominational in form as it had long been in reality. The divinity faculty was federally incorporated the same year under the style of Queen's Theological College. It is still controlled by the Presbyterian Church, but its degrees are granted by the university, to which it is affiliated. The history of the early years of Queen's is the story of a continual struggle against straitened circumstances. In 1867 the grant from the provincial government was withdrawn and the crisis came in the following year when the failure of the Commercial Bank swept away the greater portion of the endowment fund. The situation, however, was faced with determination. Rev. William Snodgrass, who was then principal, at once began an energetic canvass for a new endowment fund. His efforts reulted in the collection of $113,000 and the crisis was safely passed.

Snodgrass was succeeded in 1877 by George Monro Grant, a figure of outstanding personality whose efforts made Queen's a university of the first rank. He was a man of tremendous energy, sound in judgment and utterly fearless in the expression of his opinion on public questions. Endowed with the faculty of inspiring his associates with his own enthusiasm he soon attracted to Queen's, mainly from the universities of Scotland and England, a number of young men of energy and ability and so imbued them with the «Queen's spirit» of service and self-sacrifice that, despite tempting offers from larger institutions of learning, they remained with Queen's to work out her and their destiny. Grant's principalship was a period of great expansion. The country was canvassed from the Atlantic to the Pacific for funds, new chairs were founded, new buildings erected and the movement began to sever the existing relations with the Presbyterian Church. On his death in 1902 the institution had become one of the largest and most influential in Canada, and he himself was ranked among the foremost Canadian publicists.

The university has remained true to the democratic principles on which it was founded. The Scottish plan of allowing students a wide choice of subjects within certain prescribed limits has been followed. Students and professors are in close personal touch with one another, the seminary system being adopted in the honor classes. There are no Greek letter or other societies making for class distinctions between the students. Discipline is maintained by the students themselves under sanction of the university authorities, and students' courts having the power to pass sentence of expulsion are held annually in each faculty to discipline offenders.

The university has been a pioneer in the movement for coeducation. In 1870 classes in English and other subjects were formed for women and in 1878 courses leading to a degree were thrown open to them. In 1880 coeducation was extended to the medical course, whilst in 1883 a separate women's medical college was opened in affiliation to the university. This, however, was closed the following year as similar facilities were then offered to women elsewhere in Canada. The university has a residence for women.

A university extension department extends the benefits of university instruction to the people at large. Portions of the arts courses may be taken extra-murally and the services of the professors are available for popular lectures. Research and practical work of the faculty of applied science in mining and metallurgy has done much to further mining development in Canada, especially that of the Cobalt district. In 1914 the department of political and economic science in conjunction with the Canadian Bankers' Association instituted a course in banking designed mainly to assist men already in the service of the Canadian chartered banks. This course is divided into two parts, the associates' course, in which the university merely acts as examiner for the Canadian Bankers' Association, and the Fellows' course, in which it supplies tuition by correspondence as well. In 1914 the registration in these courses was 680 and 375 respectively.

Physical culture classes under medical supervision are compulsory for all first-year students except those taking military training. Since 1910 Queen's has maintained as part of the Canadian militia the Fifth Company of Canadian Field Engineers (Queen's). On the outbreak of the Great War in 1914 the services of these student-engineers were at once requisitioned to lay out Valcartier Camp, near Quebec, where the First Canadian Expeditionary Force of 33,000 men was concentrated. This work finished, the majority of the company proceeded to France for service on the firing line. The university also supplied the imperial government with No. 5 Stationary Hospital (Queen's) which served in the Mediterranean field of operations at Cairo and later in France. In addition two batteries of artillery, the 46th and the 50th, were recruited from Queen's men. In all the university furnished for active service 897 officers and men, of whom 664 were for service overseas. The university buildings overlook Lake Ontario and are built of Kingston limestone. They consist of the Theological building, the new Arts building, the gift of the city of Kingston; Grant Convocation Hall, erected by the students in honor of the late Principal Grant; Ontario Hall (physics, mineralogy and geology); Fleming Hall (mechanical and electrical engineering); Gordon Hall (chemistry); Nicol Hall (metallurgy); the Medical building, the Medical Laboratories building, the gymnasium and the observatory. The general university library, which contains 70,000 volumes and is particularly rich in original documents, pamphlets and reports bearing on Canadian history, is housed in the Theological building, but a new library building the cost of which was met by a donation of $150,000 from the chancellor, Dr. James Douglas, has been erected.

The faculty of applied science was incorporated in 1893 as the School of Mining, in affiliation to the university. When the latter in 1912 threw off the ties connecting it with the Presbyterian Church, steps, concluded in 1916, were taken to amalgamate the School of Mining with the university. The faculty of applied science provides instruction leading to the degrees of B.Sc., B.Sc. (Agr.), M.Sc. and D.Sc. Four-year graduate courses are offered in mining and metallurgical engineering, analytical and applied chemistry, mineralogy, geology, chemical and metallurgical engineering, civil engineering, mechanical engineering and electrical engineering. The faculty of arts has a four-year undergraduate course and grants the degrees of B.A., M.A. and Ph.D. The degrees of B.Paed. and D.Paed. are conferred by the faculty of education, whilst that of B.D. is given by the Theological College. The honorary degrees of LL.D. and D.D. are given by the university. The faculty of medicine grants the degrees of M.D., C.M., D.Sc. and D.Ph. The first classes were held in 1854. In 1866 it was separated from the university and conducted under the name of the Royal College of Physicians and Surgeons at Kingston, but it again became an integral part of the university system in 1892. Clinical work is provided in the Kingston General Hospital, the Hotel Dieu, Rockwood Hospital for the Insane and the Oliver Mowat Hospital for Tuberculosis.

Queen's has an endowment fund of $750,000 and an annual revenue from all sources of approximately $300,000. The administration of the university is vested in the board of trustees, the university council and the senate. The board of trustees consists of the chancellor, the principal and the rector, as ex-officio members, representatives from the university council, the benefactors, the graduates and co-operative members; and has charge of the external administration of the university including the finances. The senate consists of the principal, the vice-principal, the principal of Queen's Theological College, the deans of the several faculties and one or two professors elected from each faculty. It has to do with all matters of an academic nature, including instruction. Faculty boards consisting of the teaching staffs of the various faculties relieve it of much detail work. The university council is an advisory body, made up of the chancellor, the trustees, the senate and an equal number of members elected by the graduates. It elects the chancellor, except when two or more candidates are nominated, in which event he is appointed by the alumni and the registered graduates. He is the highest officer of the university and as such presides at convocation, the meetings of the university council and statutory meetings of the senate. See Canada — Higher Education.

**QUEENSBERRY, John Sholto Douglas,** 8th Marquis of, English sporting character: b. England, 20 July 1844; d. London, 31 Jan. 1900. He served in the navy when a youth, and in the army from 1859 to 1864. His life was marked by much eccentricity. He was one of the founders of the Amateur Athletic Club in 1860 and was a recognized authority on boxing and part author in 1867 of the prize-ring rules which bear his name. He sat in the House of Lords as a Scottish representative peer (1872–80). In 1881 he published 'The Spirit of the Matterhorn,' a meditation in blank verse. He also came into prominence as a supporter of secularism, and as a defender of Charles Bradlaugh (q.v.), in 1882 creating a scene in a London theatre by rising in his seat and denouncing as "an abominable caricature" the imaginary free-thinker in Tennyson's 'Promise of May.' He was instrumental in effecting the imprisonment of Oscar Wilde (q.v.) in 1895, by defending the libel action brought against him, on the grounds that what he had published was «justifiable and for the public benefit.»

**QUEENSBERRY, William Douglas,** 4TH DUKE OF, British sportsman: b. 1724; d. London, England, 23 Dec 1810. He was devoted to horse-racing and was familiarly known as «Old Q.» He was vice-admiral of Scotland in 1767–76 and was then first lord of the police until the office was abolished in 1782. He succeeded to the dukedom in 1778 and was created a British peer in 1786. In 1789 he was removed from his office of gentleman of the bedchamber and held no further office. He was notorious for his excesses and was satirized by Robert Burns in ‹The Laddies by the Banks o' Nith,› and in an ‹Epistle to Mr. Graham of Fintrie.› Wordsworth addressed him in a sonnet as «Degenerate Douglas,» and he was the original of the Earl of March in Thackeray's ‹Virginians.›

**QUEENSBERRY PLOT,** a presumed Scottish Jacobite conspiracy, so called owing to the connivance, in 1703, of the Proto-rebel James Douglas, second duke of Queensberry, with the intrigues of Simon Fraser, Lord Lovat (q.v.), to involve their common enemy, the Duke of Atholl, in a supposed conspiracy against Queen Anne. Atholl discovered the sham plot and revealed it to the queen. Queensberry, who had been a tool of Fraser, was compelled in consequence to resign his offices.

**QUEENSLAND,** Australia, a state of the commonwealth, prior to 1901 a colony. It occupies the northeastern portion of the continent, north of New South Wales and South Australia, and east of the latter. The land boundaries are mostly artificial, the meridians of 138° and 141° east and the parallels of 29° and 26° south; on the east it has the Pacific, on the north the Gulf of Carpentaria. The most northern part of it, forming York Peninsula, extends to Torres Strait, and a considerable portion is within the tropics. It has an area of about 670,500 square miles, and is divided into 12 large districts (besides smaller divisions) namely, Moreton, Darling Downs, Burnett, Port Curtis, Maranoa, Leichhardt, Kennedy, Mitchell, Warrego, Gregory, Burke and Cook. Besides the capital of the state, Brisbane, the other important towns are Ipswich, Rockhampton, Toowoomba, Townsville, Mackay, Maryborough, Gympie, Bundaberg, Charters Towers, Normanton, Cooktown and Somerset.

**Topography.**— A series of parallel ranges of mountains traverses the state from north to south near the coast, among the numerous local names being Cook Range, Razorback Range, Dawes Range and Glasshouse Mountains. The Dividing and M'Pherson ranges run from the head of the Dumaresq River in the south eastward to the coast. There is a long range in the interior running east and west and forming a watershed between rivers flowing north and those flowing south. The peak of highest elevation is Wooroonooran in a spur of the Coast Range known as the Bellenden Ker Range. Its elevation is 5,400 feet. The coast which extends for some 2,250 miles, is indented with numerous inlets, bays and harbors, some of the chief being Moreton Bay, Hervev Bay, Port Curtis, Keppel Bay, Broad Sound, Repulse Bay, Halifax Bay, Rockingham Bay, Princess Charlotte Bay. Among the numerous islands along the coast are Stradbroke, Moreton and Bribie, at Moreton Bay; Fraser or Great Sandy Island, Curtis, Whitsunday, Hinchinbrook, all off the east coast; Prince of Wales, Banks, Thursday and others in Torres Strait; and the Wellesley Islands, in the Gulf of Carpentaria. Parallel to the east coast and at no great distance runs the Great Barrier Reef.

**Hydrography.**— There are four great river-systems: (1) Rivers draining to the Pacific Coast, the chief being the Burnett, the Fitzroy, the Burdekin and the Brisbane, the last entering Moreton Bay and having Brisbane, the capital, near its mouth; (2) those draining to the Darling, comprising the Macintyre, the Condamine or Balonne and the Warrego; (3) those draining to the Gulf of Carpentaria, among them being the Flinders, the Leichhardt, the Albert, the Nicholson, the Gilbert, the Mitchell; (4) those flowing into the interior, the chief being the Victoria or Barcoo, which enters Lake Eyre in South Australia as Cooper's Creek, the Herbert, and the Diamantina or Mueller.

**Geology and Mineral Resources.**— The Cretaceous system is extensively developed in the west and northwest, covering an area of about 200,000 square miles. Tertiary strata occur along the coast of the Gulf of Carpentaria and elsewhere, and occupy a considerable area. The Desert or Eolian Sandstone, which renders extensive tracts barren and almost uninhabitable, is variously classed as Upper Cretaceous or Tertiary. Palæozoic formations also cover a large part of the country, especially along the eastern coast. About 14,000 square miles are Carboniferous, and some 40,000 of Devonian age, and the Cambrian and Silurian also occur. Mesozoic formations older than the Cretaceous are well developed in some places. Granitic rocks are very extensively developed in the east coast districts and they have been estimated to occupy about 100,000 square miles. More than 30,000 square miles are covered by volcanic rocks. Gold was discovered about 1858, and there are now more than 25 gold-fields in the state, among them being Gympie (near Brisbane), Charters Towers (on the Burdekin), Cape River, Croydon, Cloncurry and Jordan Creek. The production of 1915 is valued at £80,436,391. Other minerals of importance are copper, tin and coal, but antimony, silver, lead, bismuth, manganese, plumbago, asbestos and precious stones are also obtained. Bluestone, limestone, freestone, granite and other rocks are quarried. The coal production in 1915 amounted to 1,024,273 tons.

**Climate.**— The climate is healthful and the temperature comparatively equable. The mean temperature at Brisbane is 69°, the extreme range being from 35° to 106°. In the more northern parts the climate is tropical. The rainfall in the interior is scanty and variable; the mean at Brisbane is about 35 inches. In some parts it is now supplemented by means of artesian wells.

**Forestry, Fauna, etc.**— The state possesses various kinds of valuable timber, such as the red cedar, the Moreton Bay pine, the cypress pine and several species of eucalyptus. Some of the grasses are valuable as fodder plants. There are several good indigenous fruits. The animals and plants are similar to those of the rest of Australia. Crocodiles are found in some of the northern rivers. Pearl-fishing is extensively carried on in the extreme north, and the bêche-de-mer, dugong and other fisheries are also of some importance.

**Agriculture.**— The soil and climate are suited for the production of all the ordinary cereals, as well as maize, tobacco, coffee, sugar, cotton and other plants. Maize is more generally cultivated than any other cereal crop. The next crop in point of importance is sugar. All kinds of semi-tropical and English fruits are abundantly grown. Sheep-farming is the chief industry and cattle-breeding is also important.

**Commerce, Manufactures, Communications.**—The principal imports are apparel and haberdashery, cottons and woolens, flour, iron and steel, boots and shoes, tea, spirits, hardware, machinery, wine, etc.; and the principal exports, wool, gold, tin, sugar, preserved meat, cotton, wood, hides and skins. The imports come mainly from the United Kingdom and the United States. The value of imports for 1915–16 amounted to £7,000,912; the exports to £8,106,123. A duty of 5 per cent is charged on imports of yarns, woven fabrics, paper, stationery, etc.; and duties at other and even higher rates on other articles.

The manufactures are comparatively unimportant; the chief industrial establishments are sugar-mills, steam saw-mills, soap-works, distilleries, breweries, carriage-works, butter-factories, boot and shoe factories, cordial-factories, etc. There are 4,840 miles of state-owned railway open. The most important lines are the three which reach the coast at Brisbane, Rockhampton and Halifax Bay. In 1915 the registered shipping consisted of 164 sailing vessels of 6,107 net tons, and 124 steamers of 14,753 net tons.

**Government, Education and Religion.**— The government is vested in a governor, who is the king's representative, an executive council, and a parliament of two houses, the legislative council and the legislative assembly. The council consists of 38 members appointed by the Crown for life, no limit being put to the number; and the assembly of 72 members elected by the people for three years, and representing 72 electoral districts. In 1914 women were also enfranchised. The revenue for the year ending 30 June 1917 was estimated at £7,876,548; the expenditures at £8,034,624. Education is free and secular in the state schools, of which there are 1,550 elementary schools, six high schools and 10 grammar schools. There are also 147 private schools. A university was established for the state at Brisbane in 1911. There is no state church, each religious denomination being entirely self-supporting. Anglicans predominate, with Roman Catholic second. There are a number of charitable institutions maintained by public subscription supplemented by state endowment. The commonwealth also pays an Old Age and Invalid Pensions.

**History.**— The first settlement of Queensland took place in 1825, when the territory was used as a place of transportation for convicts, who continued to be sent there till 1839. In 1842 the country was opened to free settlers. It was originally a part of New South Wales, until in December 1859, it was organized as a separate colony under its present name instead of the earlier one of Moreton Bay District. In 1901 it became one of the states of the Australian commonwealth. Pop 1916, est. 687,480. See AUSTRALIA.

Consult Russell, H. S., 'The Genesis of Queensland' (Sydney 1888); Gray, R., 'Reminiscences of India and North Queensland, 1857–1912' (London 1913); Mathew, J., 'Two Representative Tribes of Queensland' (London 1914); Weedon, T., 'Queensland Past and Present' (Brisbane 1897); and Pugh's 'Queensland Almanac, Court Guide, Gazeteer, etc.', an annual publication (Brisbane).

**QUEENSTOWN,** Ireland, a seaport town and important naval station, in the county and nine miles southwest of Cork, on Great Island, which is situated in Cork Harbor, and rises abruptly to a considerable elevation. The streets rise above one another, and present a picturesque appearance. It has a splendid Roman Catholic cathedral. Queenstown is almost solely dependent on its military and naval establishments. It is an important port of call for mail steamers and was formerly known as COVE OF CORK. In honor of Queen Victoria's visit in 1849 the name was changed to Queenstown. Pop. about 8,000.

**QUEENSTOWN,** Ontario, Canada, village and picturesque summer resort of Niagara County, on the Niagara River, near the mouth of the gorge, seven miles below the falls, and opposite Lewiston, N. Y. Pop. 400. The Brock monument, 185 feet high, on the heights overlooking the village, commands a magnificent prospect, and commemorates the battle of 12 Oct. 1812, when General Van Rensselaer commanding 6,000 United States troops near Lewiston, sent about 1,000 men across the river in the night to attack Queenstown preparatory to a further invasion of Canada. General Brock, the capturer of Detroit, commanded the British forces, but was killed early in the action. The rest of the American troops refused to cross the river, and the attacking party, overpowered by numbers, was compelled to surrender. The American loss in killed and wounded was 300; in prisoners 958; the British lost about 130 killed, wounded and prisoners.

**QUEIROZ,** kā-ē-rōs, **José Maria Eça de.** See EÇA DE QUEIROZ.

**QUELPART,** kwĕl'pärt, **QUELPAERT,** or **TAMRA,** an island off the southern coast of Korea, about 62 miles from the mainland. Tamra is the native name of the island. In form it is nearly oval; area, about 750 square miles. It is mountainous, the highest point, Mount Auckland, or Han-ra-san, is 6,650 feet in height. This mountain is an extinct volcano; three well-defined craters exist, in each of which is a lake of pure water. One of the traditions held sacred by many of the natives is that from these lakes came the first three men of the world. The principal town is Chyei Chyu. The chief industries are fishing, agriculture, cattle-raising and manufacturing fine split-bamboo hats. Pop. 130,000. Consult Hamel, 'Narrative of Captivity in Korea' (in Griffis' 'Korea Without and Within,' New York 1885); Belcher, 'Narrative of H.M.S. *Samarang*' (London 1848), containing an account of the survery and mapping of the island by the officers of the British ship *Samarang*.

**QUENSTEDT,** kvĕn'stĕt, **Friedrich August,** German mineralogist and geologist: b. Eisleben, Germany, 9 July 1809; d. Tübingen, Germany, 21 Dec. 1899. He was educated at Berlin and in 1837 became professor of geology and mineralogy at Tübingen where he remained until his death. He made valuable investigations in geology and mineralogy and in the latter science was first to apply the analytic method to the study of crystalline systems. He wrote ‹Methode der Kristallographie› (1840); ‹Grundriss der bestimmenden und rechnenden Kristallographie› (1873); ‹Handbuch der Petrefaktenkunde› (1851; 3d ed., 1882–85).

**QUENTEL,** kvĕn'tĕl, **Heinrich,** German printer: b. Strassburg; d. 1501. He established a press near the cathedral at Cologne and though the earliest dated work from his press is ‹Fratris Astexani Opus de Casibus Conscientiæ› (1479) yet the earliest low German version of the Bible, usually stated 1470, is undoubtedly from his types and probably from his press. The business was conducted in his name for some time after his death.

**QUENTIN DURWARD,** kwĕn'tĭn dėr'wạrd, a romance by Sir Walter Scott published in 1823. The scene of this tale is France during the reign of Louis XI; the hero, Quentin Durward, is a Scottish archer, who, having a relative in the Scottish Guards of the French king, goes to France to seek his fortune. The book was written at the flood-tide of Scott's popularity at home; the ebb began with ‹St. Ronan's Well,› published six months later.

**QUÉRARD,** kā-rä'r, **Joseph Marie,** French bibliographer: b. Rennes, 25 Dec. 1791; d. Paris, 3 Dec. 1865. From 1819 to 1824 he was attached to a well-known Vienna book firm and while there prepared the first part of his ‹La France littéraire,› in which he gives a complete bibliography of France for the 18th and the beginning of the 19th centuries, including not merely notices of French writers, but of foreign authors whose works had been reprinted or translated in France. The whole work appeared in 10 volumes (1827–42). Among other works of his are ‹La littérature française contemporaine,› of which Quérard himself prepared only the first two volumes (1839–44); ‹Supercheries littéraires dévoilées› (1845–56).

**QUERCIA,** kwăr'chä, **Jacopo Della,** Italian sculptor: b. Quercia, near Siena, about 1371; d. 1438. He was the first Tuscan sculptor who combined observation of nature with study of the antique and thus reformed plastic art in Italy. His chief works are the sepulchral monument of Ilaria de Caretto in the cathedral at Lucca; a fountain adorned with the Madonna and emblematic figures of the virtues, Faith, Hope, Charity, Prudence, Justice, Temperance and Fortitude, at Siena; a marble font in the cathedral of the same city and the reliefs in the portal of the church of San Petronio at Bologna, which depicts five scene in reliefs from ‹Genesis,› five from the ‹Youth of Christ,› nine figures of the prophets and a life-size Madonna and Saint Petronius. Consult Cornelius, ‹Jacopo della Quercia› (1896).

**QUERCITRON,** kwėr'sĭt-rŏn, the inner part of the bark of the black oak (*Quercus velutina*), one of the finest of North American oaks. It is of great economic interest through its yielding the dyestuff «quercetin» ($C_{15}H_{10}O_6$), known commercially as «yellow flavin.» This substance exists in the quercitron bark in the form of its glucoside «quercitrin» ($C_{21}H_{20}O_{11} \cdot 2H_2O$). Quercitrin is also found in the market under the name of «red flavin,» and is used in that form as a dye, but its color is less brilliant and less durable than quercetin.

Yellow flavin is obtained by digesting the powdered quercitron bark with a solution of common salt to separate the gummy ingredients, which are filtered out. The filtrate is dried and extracted with dilute ammonia, and while cold is treated with a slight excess of hydrochloric acid. The precipitate is removed, and the solution of the glucoside quercitrin, which remains as the filtrate, is boiled for half an hour, at the end of which time it has been hydrolysed into quercetin, which crystallizes out in the form of pale yellow needles. These are gathered from the solution while it is yet warm, drained and washed. Quercetin is a strong dye for mordanted wool, yielding colors varying with the mordant, as follows: Bright orange with tin; reddish brown with chromium; brownish orange with aluminum; and orange-black with iron.

**QUERCUS,** the generic name for oak (q.v.).

**QUERES.** See KERESAN.

**QUERETARO,** kā-rā'tä-rō, Mexico. See MEXICO — THE STATES OF.

**QUERETARO,** Mexico, capital of the state of Queretaro, distant from the City of Mexico by the National Railway 167 miles and by the Central 153 miles, and from El Paso, Texas, by the Central 1,071 miles and from Laredo, Tex., by the National 580 miles; elevation 5,904 feet above sea-level. Here is the famous Hercules Cotton Mill, one of the oldest and most extensive in the Republic, employing almost 2,000 operatives, and here are also several other manufacturing industries, including woolen mills. Some miles distant are the famous opal mines, which have been worked for centuries, producing enormous quantities of the precious stones, but which are now becoming gradually exhausted. The water supply is obtained from the mountains through a great stone aqueduct five miles in length. The city has a complete system of electric lighting, a well-equipped street railway and many substantial business structures. The Bank of Queretaro, with a capital of $1,000,000, a branch of the National Bank and an agency of the Bank of San Luis Potosi supply the financial needs of the community. There are numerous churches, one of the oldest and most prominent of which is the Santa Rosa. The Civil College is the most notable educational institution. In this are taught law, engineering, chemistry, etc. There are two museums, one of which is devoted to history and the other to commerce; and a library connected with the Civil College contains 9,000 volumes. Other notable buildings are the Government Palace, built of basalt, the Iturbide Theatre and a bull-ring; there are also numerous parks. The city was founded by the Aztecs about 1440; was conquered by the Spaniards in 1531 and is noted in modern history as the scene of the capture, imprisonment and execution of Emperor Maximilian in

1867 by the Mexican government. Pop. about 38,000.

**QUERN,** a mill, especially a hand mill for grinding corn, used from early times among almost all races of humankind before the invention of water or windmills. The general form consists of two circular stones, the lower of which is slightly dished and the upper one pierced in the centre and revolved on a wooden or metal pin inserted in the lower. The grain is dropped with one hand into the central opening, while with the other the upper stone is revolved by means of a stick inserted in a small opening or hole near the edge. It is sometimes incorrectly confused with «churn» (q.v.).

**QUESADA,** kā-sä'thä, **Gonzalo de,** Cuban diplomatist: b. Havana, Cuba, 15 Dec. 1868; d. 1915. He was graduated from the College of the City of New York in 1888 and afterward studied at Columbia. He was secretary of the Cuban revolutionary party and associated with José Marti in the endeavor to effect Cuban independence. He served as special commissioner of Cuba to the United States in 1900, was Cuban commissioner to the Paris Exposition, and in 1901 became a member of the Cuban Constitutional Convention. In 1912 he became minister to Germany and served as delegate from Cuba to the third and fourth Pan-American conferences. He has published ‹Patriotismo›; ‹History of Free Cuba› (1898); ‹Ygnacio Mora› (1894); ‹La patria alemana› (1913), and edited José Maíté's ‹Obras literarias› (1900–11).

**QUESADA, Gonzalo Ximenes de.** See Ximenes de Quesada.

**QUESALTENANGO,** kā-säl-tā-nän'gō. See Quezaltenango.

**QUESNAY,** kā-nā, **François,** French economist; b. Méré, near Versailles, 4 June 1694; d. Versailles, 16 Dec. 1774. He was at first a surgeon, and in 1737 was made perpetual secretary of the surgeons' academy; but in 1744 he received a physician's certificate and became a favorite physician at the court of Louis XV. His works on professional subjects are wholly antiquated and he is best known as the chief of those economists whom Dupont de Nemours called the «physiocrats.» The principal tenets of this school were that there exists a natural order, with which human government should interfere as slightly as may be, and that all wealth is derived from the soil. Extravagant praise was heaped on Quesnay, who was called the «European Confucius,» while his ‹Tableau economique› (1758) was styled by Laharpe «the Koran of economists.» His economical works appeared in 1768. Consult Higgs, ‹The Physiocrats› (London 1897).

**QUESNAY DE BEAUREPAIRE,** dė bō-rĕ-pãr, **Jules,** French jurist and author, known also by the pseudonym Jean Glouvet: b. Saumur, 2 July 1838. He studied law, became for a time a journalist, later entered definitely upon a legal career and in 1889 was made procurator-general of the Paris Court of Cassation. In that capacity he appeared for the government before the Senate, constituted as a high court of justice with charges against Boulanger (q.v.) and the latter's accomplices, Dillon and Rochefort. In 1892 he was appointed president of the chamber of the Court of Cassation, from which post he was compelled in January 1899 to retire, owing to the fact that his aggressive attitude in the Dreyfus revision was interpreted by his colleagues as an evidence of bias. Among his works are ‹Le forestier› (1880); ‹Histoires du vieux temps› (1883); ‹L'etude chandoux› (1885); ‹France, 1418–29› (1895); and ‹Le Panama et la République› (1899).

**QUESNEL,** kā'nĕl', **Joseph,** Canadian poet and dramatist: b. Saint Malo, France, 15 Nov. 1749; d. Montreal, Canada, 3 July 1809. In service aboard a man-of-war he visited Pondichery, Madagascar, Africa, French Guiana, the Antilles and Brazil, thence reaching Montreal through the Mississippi Valley. The remainder of his life he spent in Montreal and Boucherville. He engaged in writing plays, songs and verse and composed some sacred music. His ‹Colas et Colinette› (1788) was first produced in Montreal. Other productions were an operetta, ‹Lucas et Lucille,› and the comedies ‹L'Anglomanie and ‹Republicains Français.› His writings are collected in the ‹Répertoiré national› (Vol. I).

**QUESNEL, Pasquier** (Paschasius), Roman Catholic theologian: b. Paris, 14 July 1634; d. Amsterdam, 2 Dec. 1719. In 1657 he entered the order of Oratorians, but subsequently through his publication of the ‹Works of Leo the Great› (1675) with annotations, in which he maintained the independence of the Gallican Church, he incurred the displeasure of the Holy See, and as he refused in 1687 to subscribe to an anti-Jansenist declaration, he was obliged to take refuge in Brussels with Arnould (q.v.) where he employed himself in completing his edition of the New Testament with moral reflections. The Jesuïts thereupon obtained from Philip V of Spain a writ through which Quesnel was taken in custody as guilty of Jansenism (1703). With the aid of his brother, however, he escaped and fled to Amsterdam, where he lived to see 101 passages in his New Testament condemned by the Holy See in the bull ‹Unigenitus.›

**QUETELET,** kĕt'lā', **Lambert Adolphe Jacques,** Belgian statistician and astronomer: b. Ghent, 22 Feb. 1796; d. Brussels, 17 Feb. 1874. In 1814, he became professor of mathematics at Ghent, in 1819 was appointed to the same chair in the Brussels Athenæum and was lecturer in the Museum of Science and Literature, 1828–34. Quetelet superintended the erection of the Royal Observatory and was its first director from 1828 till his death. His writings on statistics and kindred subjects are very numerous, and among them may be named ‹Sur l'homme et le développement de ses facultés, ou essai de physique sociale› (1835); ‹Sur la théorie de probabilitiés appliquée aux sciences morales et politiques› (1846); ‹Sur le système social et les lois qui le régissent› (1848); ‹Histoire des sciences mathématiques et physiques chez les Belges› (1864), and ‹L'Anthropométrie› (1871). He applied the mathematical methods of averages and probabilities to the study of man both as an individual and as a member of society.

**QUETTA,** kwĕt'tạ, British Baluchistan; city, on a railroad which belongs to the India railway system, and about 100 miles north of

Khelat. It is a commercial and industrial centre for a large region; but it is of great strategic importance, on account of its position among high mountains and that it commands both Bolan and Khojok passes. It is strongly fortified, and has an arsenal and a garrison. It has become a flourishing place since 1876, when a British residency was established here. Pop. about 30,000.

**QUETZAL**, kĕt-säl', a very beautiful bird of the trogon (q.v.) family (*Pharomarcus mocinno*), intimately connected with the mythology and history of the Maya, Quiche and Nahuatl races of Mexico, Yucatan and Guatemala. The name of the bird in Aztec is derived from its bright green color. Its tail feathers, which are from two to three feet long, were used as decorations for priests of the Toltec god Quetzalcoatl and for people of noble birth. So much was it used in this connection and so stringent were the restrictions placed upon its use by persons other than those entitled to wear it, that the word came to have the sense of royal and sacred in the Aztec language. The Yucatecan king of Mayapam wore for a crown a plain golden circle surmounted with a plume of quetzal feathers. Only the king and the high nobles could wear these feathers which were used to mark very exalted rank in Mayapam, and such store was placed by the quetzal that the penalty of death was provided for any one killing one or wearing or having quetzal feathers in his possession. The plumage of the quetzal was commonly used as a distinctive badge of the Toltec god of the air, Quetzalcoatl (q.v.), the incongruous parts of whose compound name (quetzal-coatl, or feathered serpent) can only be properly explained when the fact is kept in mind that «quetzal» came to be used as the badge of royalty or high rank in both men and deities. The shield and the mace or baton of authority of Huixtocihuatl, were ornamented with quetzal feathers, and the long tail feathers of this bird were sculptured on stone in Yucatan, southern Mexico and Guatemala as the symbolical representation of the Maya and Quiché culture gods. Quetzalcoatl, the «Fair God,» is presented in the form of a coiled serpent ornamented with feathers resembling those of the quetzal. Several stone effigies of him in this form are preserved in the National Museum of Mexico and others have been discovered in the ruins of ancient cities all the way from Central Mexico to Guatemala. Quetzal feathers were used as decorations for the armor of Mexican nobles in preconquest days and in the making of the wonderful feather pictures of the Aztecs and other cultured races of Mexico, and also in the manufacture of wall tapestries whose beauty brought unstinted praise from the Spanish conquerors. The palaces and temples of the Toltecs and the magnificent new palace of Montezuma II were decorated with these brilliant feather hangings. But all work of whatever class into which the feathers of the quetzal entered was reserved for the use of the king, the nobles, the statues of the gods and the temples. It has been said that the trail of the serpent (the most graphic symbol of the god of the air) is over all Mexico, but wherever the serpent is symbolically present the quetzal is its inseparable companion. In recognition of the important part played by the quetzal in the religion, history and political life of the cultured races of Mexico and Central America, it has been made the central figure in the modern coat of arms of Guatemala.

The word quetzal seems to have been used in compounds as a contraction for Quetzalcoatl; and the name of one of the Chichimeca rulers is given as Quetzal, which is probably a contraction of his ecclesiastical title as head of the state religion. All accounts of the quetzal represent it as a very shy and retiring bird inhabiting thick forests where it is rarely seen. It is not probable, therefore, that the numerous towns and localities bearing its name should have been named from its presence there. It is more likely that in each of the places so named there was a shrine of the air god, Quetzalcoatl. The presence of names beginning with quetzal far down into Guatemala is an evidence of Nahua culture in these regions and would seem to indicate the subjection of them by the Aztecs or other Nahua races since almost always the compound name beginning with quetzal is Nahuatl. Thus Quetzalpan is «place of the quetzal»; Quetzalteuhtli «the Lord Quetzal»; Quetzalatl, the «Quetzal River» or water; Quetzalpopoca, the «place of the smoky quetzal»; Quetzaltepec, the «hill of the Quetzal»; Quetzalxochitzin, composed of quetzal, xochitl (flower), tzin (princess), the «Quetzal — Flour — Princess»; the full name of Xochitl, the traditional discoverer of pulque, the national drink of Mexico. It would seem that among the collection of birds in the royal aviary or breeding place of Montezuma II in Mexico City, the quetzal was successfully raised. See Trogon; Quetzalcoatl.

**QUETZALCOATL**, kā-tzăl-kwătl, the Mexican «Fair God,» is a nature deity transformed into a great national god and the founder of a priesthood. As he is a primitive deity the legendary lore connected with him assumes many forms. He is the god of the winds who, driving the clouds before him, causes the moisture to descend upon the earth. He thus becomes the deity of the beneficial influence of the air, of medicines and of the healing art. These functions and attributes made him the god of fertility. As originally all wealth came from the fertility of the soil Quetzalcoatl became the god of wealth and of all activities that produce wealth or increase it. Thus he became the patron of artisans, farmers, planters, gardeners and workers of the soil generally, of stone engravers, cutters and builders and of gold and silversmiths and other workers in metals. Like the wind gods of other countries, he was the patron of music and the messenger of the higher gods. He was the supreme culture deity of the Toltecs and as such the revealer of all learning and the inventor and introducer of the useful arts, among them, the invention of writing and the making of books. He organized the religious ceremonies and rituals of the Toltecs and revealed to them the knowledge of astronomy and astrology. To him barren women prayed that they might be blessed with children and the agriculturist beseeched him that he might look with favor upon his fields. He it was who swept the sky clean for the coming of the tlaloques or rain gods. He was the patron of hunters, messengers, runners and of sports, and a temple devoted to his worship was always found at the entrance to the Aztec and Maya gymnasiums or courts where the native ball games were held. He was called the «Cloud Pusher» because, in his capacity as the wind, he drove them before him; as the bestower of all wealth he was the god of gaming and for the same reason thieves prayed to him, and under various epithets, he was the deity of fishermen. He made the winds to blow and he calmed them, and for this reason he was invoked in periods of storm or of prolonged calm. He divided the year into seasons, invented the calendar and named the mountains, lakes, capes, bays, rivers and other prominent features of nature. He was the special patron of feather work, painting and sculpture, and all buried treasure, demented people and travelers were under his special protection. In some of the legends he is represented as the creator of the first man. All these attributes caused him to be looked upon as the special bestower of happiness. He was called Ehecatl, the personified air; Yolcuatl, the rattlesnake; Tohil, the rumbler, and Huemac, he of the big or strong hands (probably significant of his protection of the building and mechanical arts). He was addressed as lord of the four winds, lord of the eastern light, son of the White Cloud, serpent and the Morning Star. The most beautiful of singing birds accompanied him, and when he walked he shook fire from his sandals (emblematic of the lightning), and it thus became the property of mankind.

Quetzalcoatl was the tribal god of the Toltecs. He and Huilzilopochtli, the Aztec war god, Tezcatlipoca, the Texcocan tribal deity, and Camaxtli, the Tlaxcalteca tribal divinity were popularly thought by the Aztecs to have been brothers, and there is good reason to believe that they were all tribal variants of the same mythological culture hero and god of the wind. The Tlaxcalans satisfied their own local pride by representing Quetzalcoatl to be the son of Camaxtli. The Otomi identified him with their god of hunting who seems to have been their supreme deity. Quetzalcoatl has been identified by later investigators with almost every nature deity, yet the earlier writers show that the natives regarded him as a wind god or the chief of the wind gods and the presiding deity of the air, and as such he was symbolized by the quetzal or royal bird, the cloud symbol; the snake, emblematic of the whirling wind; the flint, the material sign of the thunderbolt, and the cross, emblematic of the four regions of the earth from which came the four winds, and in a secondary sense, symbolical of his connection with the deities of moisture and the gods of fertility. Quetzalcoatl was active before the creation of man in which he seems to have taken a prominent part. Sahagun says that to him was assigned the task of sacrificing the other primal gods at Teotihuacan, on the occasion of the creation of the sun. This places him very far back in the antiquity of legendary lore. By the Toltecs and the Aztecs alike he was regarded as one of the oldest of the gods. At Tula his worship was developed to a high degree of ritual and ceremony, and it would seem that the Toltec sovereign was his representative upon earth and as such known as the Quetzalcoatl, a name used only in his religious capacity, and which must, therefore, be regarded simply as a title, since the king used his state name for all relationships outside the pontifical. This has caused a great deal of confusion, which began among the Toltecs and Aztecs themselves who represented the god as coming to the earth from the bright land of the sun and the mythical Tlapallan and teaching the people all the arts and sciences. This myth was elaborated by the ruling class who, as his representative, claimed descent from him. Thus the kings of Tula are sometimes known by their pontifical and sometimes by their executive names, as the story related was supposed, by the narrator, to be ecclesiastical or secular.

According to the myth, Quetzalcoatl appeared in the east from over the sea with a body of priestly attendants and made his way to the uplands of Mexico where tradition credits him with having preached the doctrines of peace in the Toltec capital of Tula, from which he was driven out by the wiles of Tezcatlipoca, god of the night winds. From Tula he went to Cholula where he remained 20 years teaching the arts and sciences and preaching peace. From Cholula he went to Coatzacoalcos (Puerto Mexico), from whence he sailed eastward back to Tlapallan on a raft or boat of serpents. He left behind him four of his most trusted followers who were commissioned by him to divide the land of Cholula among them and to rule it in his stead, they and their descendants, until his promised return. The return of Quetzalcoatl was firmly believed in by Toltecs, Aztecs, Zapotecas and Mixtecas alike, and on the appearance of the Spaniards off the coast of Mexico, the belief was general that they were the Fair God and his attendants come back to claim the sovereignty of the land. This belief prevented the superstitious Moctezuma II from taking energetic measures against the conqueror, Cortés, and aided the latter very materially in his conquest of the Aztec empire.

The worship of Quetzalcoatl, under various names having the same signification, was common in Yucatan, Oaxaca, Chiapas and Guatemala where magnificent temples were erected to him. There his cult shaped and ennobled the architecture of pre-Columbian days as nowhere else in America. Everywhere throughout this land is the trail of the «plumed serpent,» his most characteristic sign and a literal rendering into English of his name. See Mexi-Mythology; Toltec; Maya; Uxmal; Chichen Itzá; Tula; Palenque.

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**QUEUE ROUGE,** kē roozh, a West Indian name for a large spider much dreaded by the Negros. See Latrodectus.

**QUEVEDO Y VILLEGAS,** kā-vā'tħō ē vēl-yā'gäs, **Don Francisco de,** Spanish author: b. Madrid, 26 Sept. 1580; d. Villanueva de los Infantes, 8 Sept. 1645. After study at the University of Alcalá, he was banished the country for having killed a nobleman in a duel and went to Sicily, where he entered the service of the viceroy, the Duke of Osuna, by whom he was later made Minister of Finance in the administration of Naples. After his return to Spain he was arrested in 1639 on suspicion of having written some satiric verses against the king and ministry and subjected to a four years' imprisonment, the rigors of which caused his death. He is best known for his prose satires, such as 'Historia y vida del Beescón, El gran Tacaño' (1626), and 'Los Suenos,' 'Visions' (1635). The latter were rendered into English by Sir Roger L'Estrange in 1708. There is a Spanish edition of his works by Guerra y Orbe (1852). His prose has been published in 'Biblioteca de autores españoles' (Vols. XXIII and XLVIII); his verse, in Vol. LXIX. (See Los Suenos). Consult the study by Mérimée (1886).

**QUEZALTENANGO,** kā-säl-tā-nän'gō, or **QUESALTENANGO,** Guatemala, city, capital of a department of the same name, the second city of the republic in size and in importance, 80 miles west of Guatemala City, at an altitude of 7,500 feet above sea-level. The town is well-built with wide and well-paved streets; among its handsome public buildings are the cathedral, city hall and penitentiary. It has a considerable domestic trade and manufactures of cotton and woolen textiles. A railway about 50 miles long connects Quezaltenango with Champerico on the Pacific Coast. The city was founded in 1524 by Spaniards, on the site of a native city; there are numerous interesting antiquities in the neighborhood. An earthquake destroyed the town in 1902, but it was rebuilt. Pop. about 30,000.

**QUIAÑGAN,** kē-äng-än', Philippines, a former Spanish commandancia, bounded on the north by Bontoc, now a part of the province of Lepanto; area, 64 square miles. Pop. 30,000.

**QUIANGANES,** kē-äng-än'ās, a tribe of the Philippines, living in the commandancia of Quiañgan, province of Lepanto, Luzon. They belong to the Ifugas linguistic stock and are a headhunting people.

**QUIBDO,** kēb'dō, Colombia, town in the department of Cauca, formerly the capital of the ancient province of Choco, on the Atrato River, about 30 miles from the Pacific and 200 miles northwest of Bogotá. It was of considerable commercial importance when the gold mines of the vicinity were being worked; but the majority of the mines are now abandoned owing to lack of use of modern methods of mining. The surface gold exists now only in small quantities. Pop. about 15,800.

**QUIBERON,** kē-brôṅ, France, town, in the department of Morbihan, on the Bay of Quiberon, on a peninsula, about 22 miles southwest of Vannes. Nearby and on the peninsula are the noted megalithic monuments of Carnac (q.v.). Quiberon is now only a small fishing town; but it is of historical interest on account of the unsuccessful attempt of an English force to land here, in 1746, at the time of the Seven Years' War. On 20 Nov. 1759 Admiral Hawke attacked and overcame a French fleet under Admiral Conflans in Quiberon Bay, near the town. On 27 June 1795 a body of about 1,400 of French emigrant royalists landed here from an English fleet and tried to arouse the people of La Vendée and Brittany against the Convention. They were repulsed by a force under General Hoche, some returned to their ships, and those who were taken prisoners were shot. Pop. about 3,500.

**QUICHÉ,** ke-cha', or **KICHÉ,** an ancient nation of western Guatemala, the people of which were civilized and of the Mayan stock. Their language was a dialect allied to that spoken by the Cakchiquel. Their extant chronicles begin with the 8th century. In their sacred book, 'Popol Vuh,' an account is given of the life of their great culture hero, Xbalanque. This book gives many of the national traditions, written in the Quiché dialect. The first part of the book contains mythological accounts of their history, people, events, etc.; the second part is a detailed history of the origin of the tribe and some account of the Cackchiquel. The descendants of the Quiché now inhabit a large region in the central and western part of Guatemala. Consult Ximenez's Spanish translation of 'Popol Vuh' (Vienna 1857); Abbé Brasseur de Bourbourg's French translation of 'Popol Vuh' (Paris 1861).

**QUICHUA,** kē-choo'a, a very extensive South American Indian family composed of many tribes linguistically closely related. The Quichuas inhabit Peru and parts of Ecuador and Bolivia and neighboring territory, and their language is quite similar in grammatical structure and vocabulary to that of the Aymara who, with them, formed the greater part of the ancient Inca Empire. There seems to be some reason to believe that the Quichua, though linguistically one, was composed of the union of several races in the course of the many centuries of evolution which produced the various successive civilizations of Peru, Ecuador and Bolivia and probably the uplands of Colombia. The Quichua tongue, which was formerly the state language of the Incas, is still the chief speech of the Indian population of Peru, especially in the mountainous districts; and it is also still extensively spoken, under the same conditions, in Bolivia and in parts of Ecuador and the north of Argentina. The viceroy, Toledo, writing in 1575, after nearly half a century of civil war and Spanish conquest had frightfully decimated the Quichuas, estimated that the population of Peru, which was still very largely native, was 8,000,000. This estimate, which is probably conservative, does not include the wild Indian tribes in the mountainous districts which had still partially or wholly maintained their independence, nor the vast Quichua population of territory adjoining Peru. That the Quichuas were once a very numerous people is attested by their archæological remains, by the evidence of eye-witnesses of their land and culture at the time of the Spanish conquest and by the thousands of now deserted «andens» or terraced fields on the mountain slopes in the Andine regions, many of which are situated at an elevation of 12,000 feet, and some even considerably higher.

The civilization of the Quichuas ranks among the highest produced by the aborigines of the American continents. Its architecture was not the equal of that of Mayas, Quiches and other cultured races of Mexico and Central America, but its political organization seems to have been much better and its social life and government superior. Its religious ideas and ecclesiastical system were purer, more civilized and humane, and its system of government highways were vastly superior to anything else in the same line in the New World at the time of its discovery; and they were built on a much more extensive scale than anything then existing in Europe. Quichua was the name given by Friar Domingo de San Tomás, the first European who studied it grammatically. But Quichua was only one of many dialects of one great tongue. It was, however, one of the most important of the Quichua linguistic divisions. This ancient language of the Incas is a noble tongue fitted for all the needs of a highly developed civilization. It is flexible, has an extensive vocabulary rich in plural forms and verbal conjugations, the power of forming compound nouns and, above all, in synonyms. It has the power to express intricate abstract ideas and relationships and to record poetical and rhetorical conceptions and imagery. There seems to be no doubt that the Quichuas possessed an oral literature and drama at the time of the conquest. The latter was continued, for some considerable time after the downfall of the native dynasty, by the Indians. On several occasions their dramatic performances were officially prohibited throughout Peru. One of these, ‹Ollantay,› which depicts events in the time of one of the native rulers, has survived in an interesting, if somewhat mutilated form.

**Quichua Culture.**— The Quichuas were an artistic race in the pre-Columbian days and they were famous workers in metals, designers, builders, weavers, orators, law-makers and traders. They are supposed to have carried their commerce for thousands of miles, throughout their own vast empire, and far to the north of it, into neighboring countries. They were probably further advanced in the knowledge of medicinal plants than any other American people and less given to superstitious practices in connection with their uses. The Quichuas developed a very complicated system of keeping account by means of knotted strings of different colors which excited the wonder and admiration of the Spaniards. It has been asserted, on what seems very good authority, that these «quipus» were made use of by the Peruvians to record their history and traditions as the American Indians of the eastern States used their wampum belts, though with much more accuracy and extended application.

In the land of the Incas, which seems to have been run on a curious combination of absolutism and socialism, every able-bodied person was expected to work, and the proper distribution of wealth was carefully looked after by the emperor, who was termed «the friend of the poor»; so that, we are told, the land was enormously wealthy, and Cuzco, the capital, was the richest of all the aboriginal American cities.

**The Quichua Empire** was divided into four quarters (corresponding to the four cardinal points) by lines radiating from Cuzco; and the whole, known as the four United Provinces, was governed by viceroys, through whom the emperor kept his hand upon the reins of government throughout his vast domains. A system of division and subdivision, with responsibility to the next highest immediate authority, made the government of the whole country and the control of it by the emperor wonderfully effective. Each «cunca» of 10 families formed a community and at the same time the unit of government. Thus a most scientifically worked-out feudal system placed the responsibility, in every case, where it belonged and maintained it there. This system of supervision permitted the Inca government to organize all the resources and facilities of the empire; and the result was that not a spot capable of cultivation was neglected. Terraces were built on the sides of the mountains, from the foothills to the cold regions of the limit of vegetation, some of these upper terraces being not more than a yard wide. Irrigation was made a science. Canals starting at the snow-line carried the water down the mountain side from one terrace to another, while more extensive irrigation works brought the arid lands of the coast under subjection and rendered the pasture lands fertile. Even the flow of water was regulated by the government to the extent; altitude and nature of the land to be irrigated. Vast herds of llamas and alpacas supplied meat and the finest of wool for the whole nation; as did also the wild huanacus and vicuñas. The Inca government also looked after the distribution of the population and saw that the people were placed where they could most easily make a living and contribute to the growth and greatness of the empire. See Peru.

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**QUICK, Sir John,** Australian statesman and author: b. Saint Ives, Cornwall, England, 14 April 1852. He was taken to Australia by his parents in 1854 and was educated there. At the age of 15 he became a compositor on a local paper, where he successfully tried his hand at literary work. He worked on several daily papers and continued his studies at the University of Melbourne from which he was graduated in arts in 1877 and in law the following year. Two years later he was elected to Parliament where he became a prominent advocate of Australian federation. He was a member of the convention which framed the constitution of the commonwealth (1897–98) and chairman of the tariff commission (1905). He had already been knighted in 1901 for federal services, and was postmaster-general of the commonwealth (1909–10). A recognized authority on constitutional law, he has written the ‹History of Land Tenure in Victoria› (1893); ‹Parliamentary Government in Victoria› (1894); ‹A Digest of Federal Constitutions› (1896); ‹The Federal Constitution Explained› (1898); ‹Annotation of the Constitution of the Australian Commonwealth› (1901); ‹Judicial Power of the Commonwealth› (1904); ‹Imperial Unity and How to Promote It› (1908); ‹Workers' Compensation Act› (1915).

**QUICK-SAND,** a tract of loose sand mixed with water which will not support heavy bodies. In appearance quick-sands do not differ from the adjacent sands. They usually occur on flat shores underlain by stiff clay or other impervious materials and especially near the mouths of large rivers. They appear to be formed by the continued collection of water within the sand bank which is prevented from running off by the underlying impervious layer. The water which infiltrates the sand may be supplied, either by a river current, directed against the concave shore or spreading over a sea-beach; by tides which at their ebb leave behind them imprisoned bodies of water; or by sea-currents running through narrow channels and forcing the water against the adjacent shore. The grains of quick-sand have rounded surfaces, as distinguished from angular or «sharp» sand. It is, moreover, of very light weight. The infiltrated water separates and lubricates the particles, rendering them unstable and unable to support a heavy weight, such as the body of a man. They have obtained a great reputation for treachery and danger, especially because they cannot be distinguished at sight. The subject has been drawn upon considerably in literature, notably in Hugo's ‹Toilers of the Sea,› in Wilkie Collins' ‹Moonstone› and in the ‹Bride of Lammermoor,› with probably some exaggeration of the danger. The effect of quick-sands, however, is well illustrated by the sinking in 1875 of a locomotive and train at Pueblo, Colo., which sank beyond discovery though probed for to a depth of 50 feet. To make it possible to operate in quick-sands engineers are accustomed to congeal them by forcing into them brines and liquids at low temperatures.

**QUICKSILVER.** See Mercury or Quicksilver.

**QUIDDE, Ludwig,** German writer on mediæval history and modern politics: b. Bremen, 23 March 1858. He became a professor at the University of Munich, a member of the Bavarian Landtag and the board of aldermen of the capital of the kingdom. He edited a series of publications of German imperial documents of the 15th century and attained a widespread sensational reputation by the publication, in 1894, of a work called ‹Caligula,› ostensibly a biography of the dissolute Roman emperor, but actually a neatly veiled presentation of the foibles of Emperor William II of Germany. The book passed through 30 editions in one year, which, as it was an historical work, was enough to attract the attention of the public prosecutor. Quidde was brought up for trial, but defended himself so ably that he was acquitted. On being asked by the prosecuting attorney whom he had had in mind during the composition of his work, he answered, «Caligula, of course,» and confused the prosecutor by asking «Whom have you in mind?» Other works are ‹Der schwäbisch-rheinische Städtebund im Jahre 1384› (1884); ‹Militarismus› (1893); ‹Wetterleuchten der Reaktion› (1895); ‹Bayerische Steuerreform› (1909).

**QUIDOR, John,** American painter: b. Gloucester County, N. J., 1800; d. 1881. He removed to New York in 1826 and studied painting under John Wesley Jarvis and Henry Inman. While his work showed great cleverness he failed to gain recognition in his lifetime and earned a livelihood by painting fire engines and panels for coaches. He excelled in fanciful subjects with a landscape background. His best-known work, now recognized as evidencing fine talent, illustrated scenes from the works of Washington Irving, whom he knew personally. His ‹Rip Van Winkle› is considered an excellent piece of work. Other paintings, also from Irving's works, and now in the Brooklyn Institute, are ‹Dancing on the Battery›; ‹Peter Stuyvesant's Wall Street Tale› (1864); ‹Voyage from Communipaw to Hell Gate› (1866); ‹Voyage of the Good Olaf Up the Hudson› (1866).

**QUIDS,** in American political history, a name applied to a faction of the Republican party led by John Randolph from 1805 to 1811. They were opposed to the nomination of Madison, Jefferson's choice for the succession. They declared war on the administration party in 1806, as governing Congress by backstairs influence. They opposed the restrictive system and nominated Monroe in 1808. Their leading ground of divergence from the administration was that it had moved away from the ground occupied by the party when in opposition, and in the direction of centralization and Federal encroachment. The name is derived from «tertium quid» and signifies their separation from both parties.

**QUIETISM,** a tendency in religious devotion rather than any specific system of religion or mysticism. It consists in making Christian perfection a state of uninterrupted contemplation of divine things, the soul meanwhile remaining quiet and entirely passive under the divine influence, heedless of the customary precepts of practical religion, and without thought of rewards or punishments in another world, which are the master motives of vulgar piety. The term Quietism was first used to designate the mystical teaching of Miguel de Molinos (q.v.) who died (1696) in the prison of the Holy Office at Rome to which he had been condemned for teaching in sundry of his writings that the perfect Christian life consists in passive contemplation, unaffected by hopes or desires, and that the soul thus occupied neither gains by good works or acts of piety, nor suffers through the commission even of gross sins, for these affect only the lower nature of the devotee and cannot bring any strain upon the purity of a contemplative soul. The amiable Fénelon (q.v.) was won over to hearty acceptance of some of the less objectionable features of Quietism by the influence of his disciple Madame Guyon (q.v.), several of whose mystical writings he approved and defended when they were condemned by the Gallican church authorities, among them Bossuet, bishop of Meaux, who declared them to be a «mass of extravagances, illusions, and puerilities.» Fénelon's published apology for the doctrines of Madame Guyon having been censured at Rome as containing propositions rash, scandalous, etc., he promptly bowed to the judgment of the Holy See, publicly committing his own book to the flames. Consult Heppe, H., ‹Geschichte der quietistischen Mystik› (Berlin 1875).

**QUIETISTS.** See QUIETISM.

**QUIGLEY, James Edward,** American Catholic prelate: b. Oshawa, Ontario, 15 Oct. 1854; d. 10 July 1915. He was graduated from Saint Joseph's College, Buffalo, N. Y., in 1872. He then began his theological studies at the Vicentian Seminary, Niagara, N. Y., now Niagara University, and continued them at the University of Innsbruck, Austria, completing his entire course at the Propaganda, Rome, where, in 1879, he obtained the degree of doctor of theology, and was ordained priest 13 April of the same year. Returning to the United States, he was appointed pastor of the Church at Attica, Wyoming County, N. Y., and in 1884 was named rector of the Cathedral, Buffalo, N. Y. In 1896 he asked to be transferred to the rectorship of Saint Bridget's Church, Buffalo, made vacant by the death of Monsignor Gleason, but his residence in that parish was short, as, on 24 Feb. 1897, he was consecrated bishop of Buffalo to succeed Bishop Ryan, deceased. Bishop Quigley was chosen arbitrator in the great labor strike in Buffalo during 1904, and on 8 Jan. 1903 was promoted to the archiepiscopal see of Chicago. The archdiocese comprises a Catholic population of approximately 1,000,000; 619 priests; 316 churches; 168 parochical schools; 7 orphan asylums; 18 hospitals and many other charitable and educational institutions.

**QUILL,** the hollow stem of a feather (see PLUMAGE). Many utilities have been found for those of the larger size, but their use is declining. The principal use of quills is still for making pens, for which the feathers of the swan are most highly esteemed, but goose-quills are most commonly used. Crow-quills are said to be best for fine writing and drawing. In preparing quills for making into pens, they must first be cleaned inside and outside of fatty matter, which would prevent the ink from flowing freely. This is done by burying the quill-ends of the feathers for a few seconds in fine sand at a temperature of about 140° F. The quills are then polished and dried.

**QUILLAIA** (kwĭl-lă'yä) **BARK,** the bark of a South American tree (*Quillaia saponaria*), belonging to the division *Spræa* of the order *Rosaceæ.* The tree has smooth, oval leaves, and white terminal flowers, solitary or in small clusters.

**QUILLER-COUCH,** kwĭl'ėr kooch, SIR **Arthur Thomas,** English author: b. Cornwall, 21 Nov. 1863. He was educated at Oxford, where he was classical lecturer in 1886–87, and won some success with his first book, ‹Dead Man's Rock› (1887). In 1887 he began a literary career in London, where in 1889 he joined the staff of the *Speaker,* the Liberal weekly newly established by Sir Wemyss Reid. He was knighted in 1910, and succeeded to the professorship of English literature at Cambridge in 1912. He retained until 1899 his connection with the *Speaker,* a part of his contributions to which appear in the collections of short stories, ‹Noughts and Crosses› (1891) and ‹The Delectable Duchy› (1893). Among his further volumes are ‹Green Bays: Verses and Parodies› (1893); ‹The Golden Pomp› (1895), an Elizabethan anthology; ‹Ia› (1896); ‹Adventures in Criticism› (1896); being selected reviews; ‹The Ship of Stars› (1899); ‹Old Fires and Profitable Ghosts› (1900); ‹The Laird's Luck› (1901); ‹The Westcotes› (1902); ‹The White Wolf› (1902); ‹The Adventures of Harry Revel› (1903); ‹Hatty Wesley› (1903) and ‹Shining Ferry› (1905); ‹Shakespear's Christmas› (1906); ‹From a Cornish Window› (1906); ‹Poison Island› (1907); ‹Major Vigoreux› (1907); ‹True Tilda› (1909); Lady Good-for-Nothing›; ‹Corporal Sam and Other Stories› (1910); ‹Hocken and Hemken› (1912); ‹Nicky Nan, Reservist› (1915); ‹On the Art of Writing› (1916); ‹Memoir of Arthur John Butler› (1917). He published also three anthologies of English verse, which are marked by the finest appreciation of lyric quality. His style is vivid, his humor subtle and poignant and his imagination vigorous and colorful. These qualities gained him the commission to complete the novel ‹St. Ives,› left unfinished by Robert Louis Stevenson (q.v.). His earlier work appeared over the pseudonym «Q.» Much of his material he has derived from Cornwall, where he has made particular study of the Welsh poor.

**QUILP,** kwĭlp, a malicious and hideous dwarf who figures prominently in Charles Dickens' novel, ‹Old Curiosity Shop.› He torments and abuses his wife Betsey, and when about to be arrested for felony drowns himself.

**QUIMBY,** kwĭm'bĭ, **Phineas Parkhurst,** American mental healer: b. Lebanon, N. H., 16 Feb. 1802; d. Belfast, Me., 16 Jan. 1866. In 1838 his interest in hypnotism was awakened through a series of lectures given in Belfast by a Dr. Collyer. He made a special study of the subject and afterward traveled through Maine and New Brunswick giving exhibitions of mesmerism. His interest was then aroused in the relation of mesmerism and healing and he thereafter devoted himself to mental healing, although he later dispensed with mesmerism as unnecessary in the diagnosis and mental cure of disease. In 1859 he opened offices in Portland, Me., although retaining his residence in Belfast. Mrs. Mary Baker G. Eddy, then Mrs. Patterson, was one of his patients in 1862, but always disclaimed being influenced by him in the foundation of the cult of Christian Science. In an article written by Quimby in 1863 he uses the term «Christian Science,» and one of his patients, a Dr. Evans, made repeated use of the term «mental science» in articles written in 1869. Quimby's influence in this field in the middle of the 19th century was considerable. Consult Dresser, A. G., ‹The Philosophy of P. P. Quimby› (1895).

**QUIMPER,** kăṅ pār', France, sometimes called QUIMPER-CORENTIN, capital city of the department of Finistère, lying at the junction of the Steir and Odet, whence the name from

Breton ‹Kemper,› junction or confluence. It has the fine cathedral of Saint Corentin, built in 1424, and two churches — one, that of Locmaira dating from the 11th century; the other, Saint Mathieu, dating from the 16th. The old capital of Cornouailles, it figured in the religious wars. It has sardine-fisheries, breweries, paper factories, tanneries and a population of about 20,000.

**QUIN**, kwĭn, **James**, English actor: b. London, 24 Feb. 1693; d. Bath, Somerset, 21 Jan. 1766. He was the son of an Irish barrister, and was educated in Dublin. In 1714 he went upon the Dublin stage, and a year after appeared at Drury Lane Theatre. In 1717 he went to the theatre in Lincoln's-Inn-Fields, where he remained 14 years, and acquired celebrity in characters of grave, dignified and sententious tragedy, as in Cato, Zanga and Coriolanus (in Thomson's tragedy of that name), and in those of strong, sarcastic, comic humor, as Falstaff and Volpone. In 1735 he returned to Drury Lane, on such terms as no actor had previously received; and he retained pre-eminence until the appearance of Garrick in 1741. In 1747 he was engaged at Covent Garden with Garrick; but the new actor obtained so great a share of attention that Quin retired from the regular stage in 1751. His last performance was Falstaff (1753), in which character he is supposed never to have been excelled. Garrick, once his rival afterward his friend, wrote the epitaph for his monument in Bath Abbey. Consult Doran, J., ‹Annals of the English Stage› (3 vols., London 1887).

**QUINAULT**, kē-nō, **Philippe**, French dramatist: b. Paris, 3 June 1635; d. there, 26 Nov. 1688. He studied law, but became a playwright, his first dramas ‹Les rivales›; ‹L'Amant indiscret› being produced when he was 18 and meeting with marked success. The continued success of his tragedies, comedies and tragicomedies, of which he produced 16, made him a mark for the satire of Boileau, and he abandoned tragedy and engaged in writing librettos for the operas of Lulli. In this field he displayed great originality and though his success at the time was attributed to Lulli's music by Boileau and other critics, his verse is still read and admired while the music is forgotten. He was admitted to the French Academy in 1670 and his later years were spent in ease and comfort. Of his operatic pieces ‹Armide› and ‹Atys› are best known and of his dramas ‹Astarte› (1663) and ‹La Mère Coquette› (1665). Editions of his works were published in 1739, 1842 and 1880. Consult Richter, E., ‹Philippe Quinault› (Leipzig 1910).

**QUINCE**, a shrub or small tree (*Cydonia vulgaris*) of the rose family; a native of central and eastern Asia, where it was cultivated more than 2,000 years ago and whence it has been introduced into all cool temperate countries of the civilized world. It is a close relative of the apple and pear, with which trees some botanists class it, but from which it is distinguished by having its flowers solitary upon the ends of twigs of the present season's growth. The popularity of the quince is limited because it is inedible in the fresh state, but it is highly prized for making preserves, jellies, etc., and as a flavoring for mixing with other fruits.

The plant is propagated mainly by stool layering, the rooted layers being grown in nursery rows usually two years after their removal from the parent bush. They are then planted from 10 to 15 or more feet apart, the distance depending upon the soil. On light soils the shrubs make rapid growth but are shorter lived and less productive than upon heavy. They should commence to bear when about three years old and reach full bearing when 10. Contrary to popular opinion the quince will do best when cultivated, but the stirring of the soil must not be deep because the feeding roots are rather close to the surface, especially if the soil be very moist. To obviate this danger, growers often set the plants rather deeply and for the first few years work the soil away from them so as to induce deep rooting. They always use shallow rooting cover crops. It is another popular misconception that the plants do best in undrained soil. The best orchards of western New York, where the quince is an important crop, are upon well-drained land.

The tree seldom grows more than 15 feet tall. It should be trained in bush form; that is, with several stems, though some growers prefer the tree form with only one stem. The latter seems more likely to be injured by borers. Beyond the removal of interfering, dead or unnecessary limbs the pruning consists of «heading-in» the twigs, a process which reduces the number of fruits. Being fairly hardy and a rather late bloomer the quince is a very regular annual bearer, but unless the tops be kept open and the quantity of fruits reduced the specimens will be inferior. Though the fruits ripen late and when gathered are generally very hard they should be handled very carefully and not be allowed to freeze. Except as indicated the management of a quince orchard is much the same as for pear orchard.

Among the insects which feed upon the quince are several borers, scale insects, caterpillars, plant-lice, etc., which are found on other fruit trees, especially apples and pears. These may be controlled in the same way. (See APPLE; PEAR; INSECTICIDE.) The quince curculio (*Conotrachelus cratægi*), a broad-shouldered snout-beetle of American nativity, lays its eggs in the fruit in early summer. It may be controlled like its relative the plum curculio. (See PLUM). Several so-called plant diseases common to the pear and apple are sometimes reported upon the quince. They have been combated in the same way as on the other fruits. Consult Bailey, ‹Cyclopedia of American Horticulture› (New York 1900–02); Meech, ‹Quince Culture› (New York 1896).

**QUINCKE, Georg Hermann**, German physicist: b. Frankfort-on-the-Oder 1834. He was educated at the universities of Berlin, Königsberg and Heidelberg, and in 1859 was privatdocent at the University of Berlin. In 1872 he was appointed to a chair at the University of Würzburg, and in 1875 became professor of physics at Heidelberg. He has made important investigations of capillary phenomena, and valuable researches respecting electric influence upon different forms of matter. He was created D.C.L. by Oxford, LL.D. by Cambridge and became honorary Fellow of the Royal Society of London. Besides his contributions to physics and other sciences, he wrote ‹Geschichte des physicalischen Instituts der Universität Heidelberg› (1885).

**QUINCUNX,** an arrangement of five objects in a square, one at each corner and one in the middle. It is particularly employed in reference to the arrangement of trees. The term is frequently used in astronomy.

**QUINCY,** kăṅ-sē, **Antoine Chrysostome Ouatremère de.** See QUATREMÈRE DE QUINCY, ANTOINE CHRYSOSTOME.

**QUINCY,** kwĭn'zĭ, **Edmund,** American author, son of Josiah Quincy (1772–1864): b. Boston, Mass., 1 Feb. 1808; d. Dedham, Mass., 17 May 1877. He was graduated from Harvard in 1827, was a prominent and able contributor to the anti-slavery press and wrote ‹Wensley› (1854); ‹Life of Josiah Quincy› (1867); ‹The Haunted Adjutant and Other Stories› (1885) and edited ‹Congressional Speeches› (1874).

**QUINCY, Josiah,** sometimes called JOSIAH QUINCY, JR., American lawyer: b. Boston, Mass., 23 Jan. 1744; d. at sea off Gloucester, Mass., 26 April 1775. He was graduated from Harvard in 1763, studied law in the office of Oxenbridge Thacher and acquired a large practice. After the «Boston Massacre» (q.v.), he was selected with John Adams, by Captain Preston as counsel for the defense. He wrote many political pamphlets and contributed much to contemporary journals. In 1774 he sailed for England, where he consulted with the friends of America, but died on the return voyage. An able orator, he was among the first to assume a bold revolutionary attitude. Though he incurred at the time some odium for his defense of Parker, his course was later strongly commended. His ‹Life› was published by his son Josiah (q.v.).

**QUINCY, Josiah,** American statesman and educator: b. Boston, 4 Feb. 1772; d. Quincy, Mass., 1 July 1864. He was graduated from Harvard in 1790, studied law and in 1793 was admitted to practice, and gave much study to political problems. By his oration in Old South 4 July 1798, he gained so extended a reputation that in 1800 he was made Federalist candidate for representative in Congress. Though defeated then through the ridicule of Republican journals, he was elected in the autumn of 1804 after having in the spring of that year been chosen to the State senate. He remained in Congress until 1812, when he declined re-election. He was a finished orator, spoke boldly on many difficult topics of debate, and was one of the most efficient members of his party, which during his whole term of service remained hopelessly in the minority. His statesman-like grasp of affairs is most clearly shown by the constant emphasis which he placed upon the increasing political danger with which the Union was menaced by the slave power. He feared civil war, and preferred a peaceable secession — a course not then seen, as it was later, to be impossible. In the State senate he urged Massachusetts to suggest to Congress an amendment of the Constitution, by which the clause permitting slave-States to reckon three-fifths of the slave population in obtaining a basis for representation was to be stricken out. Of course, such a measure, had it succeeded, would have resulted in the dismemberment of the Union. Quincy opposed the annexation of the Louisiana territory, and in his speech of 4 Jan. 1811 took the advanced Federalist position that the Constitution did not confer on Congress power to admit any new States save such as might be formed from territory belonging to the United States in 1787. He declared that, if the bill passed, the Union was thereby dissolved, and that it would be the right of all States and the duty of some «to prepare definitely for a separation.» This is believed to be the earliest enunciation in Congress of the doctrine of secession. Eventually Quincy acquiesced in the purchase, upon each of the original 13 States signifying its assent. He attacked the Embargo, and opposed the War of 1812, though unlike many Federalists, he supported the administration, and on 25 Jan. 1812 made in the House a notable speech on the navy. Upon his retirement from Congress in 1813, he was at once elected to the State senate, where he remained until 1820, then entering the House of Representatives, of which he was speaker until his resignation in 1822 to become judge of the Boston Municipal Court. In this capacity he was the first to hand down the ruling then much criticized but now accepted in the United States and England, that the publication of truth with good intent and for a justifiable end is not libel. From 1823 to 1828 he was second mayor of Boston; during his administration all the municipal departments were put in efficient working order. In 1829 he became president of Harvard, and this post he held until his retirement in 1845. In 1856 he was a supporter of Fremont for the presidency. Besides several speeches, he published ‹History of Harvard University› (1840); ‹History of the Boston Athenæum› (1851); ‹The Municipal History of Boston› (1852); ‹Memoir of John Quincy Adams› (1858) and other works. Lowell refers to him as «a figure of admirable example in a democracy as that of a model citizen.» Consult Quincy, ‹Memoir› (1867); Lowell, ‹A Great Public Character› in ‹My Study Windows› (1867).

**QUINCY, Josiah,** American lawyer, son of Josiah Quincy (1772–1864): b. Boston, Mass., 17 Jan. 1802; d. Quincy, Mass., 2 Nov. 1882. He was graduated from Harvard in 1821, served as president of the Massachusetts senate in 1842, was mayor of Boston in 1845–49 and wrote ‹Figures of the Past› (1882).

**QUINCY, Josiah,** American politician, son of Josiah Phillips Quincy: b. Quincy, Mass., 15 Oct. 1859; d. 8 Sept. 1919. He was graduated from Harvard in 1880 and was admitted to the bar but never practised. He was a leading member of the Democratic party, was chairman of that party's State committee and manager of the literary bureau of the National Committee in 1892. He served four years in the Massachusetts legislature and in 1893 was appointed Assistant Secretary of State by President Cleveland, serving six months. In 1895 he was elected mayor of Boston and in 1897 re-elected, his progressive policy in regard to the extension of municipal functions attracting wide attention. He established the department of municipal statistics, a municipal printing-office and electrical construction department, greatly increased the number of public baths and provided public lectures and concerts and organized eight unpaid commissions to have charge of the city's charitable institutions, public baths and other improvements.

**QUINCY,** Fla., city and county-seat of Gadsden, 24 miles northwest of Tallahassee, on the Seaboard Air Line and the Georgia, Florida and Alabama railroads. It is situated near the northern border of the State in a productive cotton and tobacco district and there are also large deposits of fuller's earth; the town has a considerable trade in these products. Pop. (1920) 2,540.

**QUINCY,** Ill., city, capital of Adams County, on the east bank of the Mississippi River, 263 miles south of Chicago and 142 miles north of Saint Louis. It is built on an elevated plateau 160 feet above the high-water mark of the river. The trade of the city is extensive and is distributed on seven lines of railroad and the Mississippi River. The commercial interests of Quincy are represented by 1,500 firms with a capitalization of over $15,000,000, embracing almost every kind of industry. Quincy is known particularly as a manufacturing city, there being eight foundries with a capitalization of $2,000,000; seven machine shops with a capitalization of over $1,000,000; five carriage manufactories with a capitalization of $1,000,000; five flour-mills with a capitalization of $500,000; also the largest steam-governor plant in the world, with a capitalization of $1,000,000; two breweries with a capitalization of $1,000,000 and four incubator factories with a capitalization of $1,000,000. There are also manufactories of furniture, plows, tobacco, organs, soap, files and matches. Many of the streets are traversed by electric railways, the total extent of which is 27 miles, giving access to all the principal business points and parks. The city is divided into seven wards. Of public and charitable buildings, the city contains two hospitals, with a combined capacity of about 300 beds; a free public library and reading room, with 40,000 volumes; 10 asylums and homes and 33 churches, representing about all the denominations found in a community of the size of Quincy. Of public schoolhouses there are 15, having been built at an aggregate cost of $750,000, with a corps of 163 teachers. The attendance of the public schools number 5,400 children. Besides these there are 12 parochial schools that have an attendance of 2,400 children with an attendance among the three colleges located here that have an attendance estimated at about 1,500. Quincy's Federal building and courthouse are buildings worthy of any city, so is the city hall, Y. M. C. A. building, Masonic Temple, Chamber of Commerce building, State armory, Knights of Columbus building, Labor Temple. Quincy was settled and laid out by John Wood in the year 1821 and to his memory there has been erected a statue in Washington Park. Quincy has a series of 16 nicely located parks situated in different parts of the city connected by a boulevard surrounding the city and in all aggregating 300 acres. This in connection with the Illinois Soldiers' and Sailors' Home, which contains 225 acres, makes ample room for out-door recreation. The Illinois Soldiers' and Sailors' Home, situated upon these beautiful grounds, is complete in every detail and has a capacity for 2,000 veterans and the average attendance is about 1,700. The water supply of Quincy is given from a reservoir with a capacity of 20,000,000 gallons at an elevation of 229 feet above the city, giving an average pressure of 40 pounds, the water before entering the reservoir being thoroughly filtered, making it absolutely pure. The pumping capacity is supplied by a triple expansion engine of 8,000,000 gallons daily and one compound engine of 4,000,000 gallons capacity daily, the water being filtered by 14 jewel gravity mechanical filters, therefore, insuring the city over its distributing system of 45 miles of water mains, an inexhaustible supply of water as the water is derived from an intake pipe from the channel of the Mississippi River. The city owns the waterworks. The 40 counties within a radius of 75 miles of Quincy, comprise 21,337 square miles; a population of 861,000; 93,600 farms, worth $1,092,162,000, with annual products worth $131,700,000. The urban population in these 40 counties is 210,000. The principal agricultural products are wheat, oats, corn, livestock, fruit. The immediate retail trade territory, 13 counties, comprises a population of 300,000. The immediate jobbing territory, Illinois, Iowa and Missouri, comprises a population of 11,000,000. Pop. of Quincy, 35,978.

**QUINCY,** Mass., city in Norfolk County, on Quincy Bay and on the New York, New Haven and Hartford Railroad. The city includes within its corporate limits several villages; its area is about 16⅛ square miles, nearly four square miles of which are in public parks. It is bounded on the north by Neponset River and on the south by Fore River. It was settled in 1625 and was first known as Mount Wollaston. About four years later Thomas Morton (q.v.) obtained control of the settlement and established his «New English Canaan,» «Merry Mount.» His institution of the «May Pole» and other «Idolls» and his manner of living in general, offended the Puritans of Boston and they thought him a dangerous man in the new country. He was arrested by Miles Standish and sent back to England. The place remained a part of Braintree until 1702 when it was incorporated as Quincy, after John Quincy. In 1888 it was chartered as a city.

The first railroad in New England was constructed here in 1826–27; it was two miles long operated by horses and used for carrying stone for building Bunker Hill Monument. There are many places of historic interest in and around Quincy and some of the buildings of Revolutionary days are still in existence. Quincy came into great prominence the last quarter of the 19th century, on account of an educational movement under the leadership of Francis Wayland Parker (q.v.). Many prominent people have lived in Quincy; it was the birthplace of John Adams, John Quincy Adams and John Hancock. The Adamses are buried under the old «Stone Temple.»

Quincy is largely a residential suburb of Boston; but the quarrying interests are still of importance. It has also a large ship building plant, machine and tools shops. It has a city hospital, the Woodward Institute for girls; the Adams Academy, a high school, elementary public schools and the Thomas Crane Public Library, which contains about 25,000 volumes. The Metropolitan District System supplies Quincy with water. The government is administered under a revised charter of 1900, which provides for a mayor and council, elected annually. The school board is chosen by popular vote. The mayor appoints the heads of all departments except that of the school board. The council elects the other administrative officials. Pop. (1920) 47,876. Consult Adams, ‹Three Episodes of American History›; Hurd, ‹History of Norfolk County›; Pattee, ‹A History of Old Braintree and Quincy›; Wilson, ‹Where American Independence Was Born›; Adams, ‹The Centennial Milestone›; Report of United States Commissioner of Education, Vol. I (1902), on the Quincy educational movement; Partridge, ‹Quincy Methods.›

**QUINET,** kē-nā, **Edgar,** French litterateur: b. Bourg, 17 Feb. 1803; d. Versailles, 27 March 1875. He was educated at the schools of Charolles and Bourg and the Lycée of Lyons. His first publication was ‹Tablettes du Juif Errant› (1823), an apology for his abandoning the military career which had been planned for him. A visit to Germany introduced him to Herder's ‹Philosophy of the History of Humanity,› which interested him profoundly and gave direction to his life studies. He published a translation with an introductory essay in 1827. Living at Strassburg he met Victor Cousin and Jules Michelet, the latter of whom became his closest friend. In 1829 he was chosen by the French Academy to go to the Morea as philologist attached to a commission of *savants,* and on his return in 1830 published ‹De la Gréce moderne et de ses rapports avec l'antiquité.› His republican sympathies were stirred by the revolution in July and his feelings gained expression in political pamphlets. He wrote a remarkable prose poem ‹Ahasuerus› (1833) and later two other epics, ‹Napoleon› (1836) and ‹Prométhée› (1838). His purpose in these three was to represent humanity as general, individual and religious — Ahasuerus, the race; Napoleon, the individual and Prometheus, the martyr. In 1838 he published a reply to Strauss' ‹Life of Jesus›; the next year was appointed professor of foreign literature at Lyons and in 1841 became professor of southern literature in the College of France. His Lyons lectures were published under the titles, ‹Génie des Religions› (1842) and ‹Le christianisme et la Révolution Française.› His lectures delivered at the College of France attacking the Jesuits so aroused public feeling that the government closed his class-room in 1846. His republican opinions became so pronounced and his expression so outspoken that after the *coup d'état* of Louis Napoleon in 1851 he was banished from France. His exile, which lasted until after the fall of the empire in 1870, was fruitful in such works as ‹Marnix de Saint-Aldegonde› (1856); ‹L'histoire de mes idées› (1858); ‹Merlin l'enchanteur› (1860) and the ‹Révolution française› (1865). Re-established in Paris, he was elected to the Chamber of Deputies and voted consistently against all monarchial reaction and for the secularization of laws. His last work, ‹L'esprit nouveau› (1874), contains an expression of his social, political and intellectual creed. His complete works were published in 30 Vols. (1877–82). Consult his ‹Lettres d'exil› (1884); ‹Edward Quinet depuis l'exil› (a biography by his widow, 1888–89); Heath, ‹Edgar Quinet: His Early Life and Writings› (1881).

**QUIÑGUA,** kēng'wā, Philippines, pueblo, province of Bulacá, Luzon; on the Quiñgua River, seven miles from its mouth; six miles north of the town of Bulacán. It is a road centre and is a health resort for the surrounding provinces because of its pure water. Pop. 8,860.

**QUINIDINE,** or **CONQUININE** ($C_{20}H_{24}N_2O_2$), an alkaloid found in Calisaya bark (*Cinchona Calisaya*), and in some other varieties of «Peruvian bark.» It is prepared from the mixed cinchona alkaloids (quinoidine) by extracting the powder with ether; shaking with dilute sulphuric acid; neutralizing with ammonia; and precipitating with Rochelle salt. The filtrate is then concentrated, decolorized with charcoal, and precipitated with a strong solution of potassium iodide. The crude quinidine hydriodide is then dissolved in alcohol, and precipitated with ammonia; dissolved in dilute acetic acid; precipitated again with ammonia; and finally crystallized from a boiling hot solution in alcohol. It is also prepared from the mother-liquor remaining after the manufacture of quinine. Common soda is added, and the crude quinidine is precipitated. This is then turned into iodide, and the process continues as above described.

In medicine quinidine is known to be a more powerful febrifuge than quinine, being effective in 17 per cent more cases. Its small yield, as compared with quinine, from the bark extract restricts its manufacture and use. See Quinine.

**QUININE** (kwin'ēn or kwī'nīn), **QUININA,** or **QUINIA,** a drug ($C_{20}H_{24}N_2O_2$) largely used in the cure of malarial fevers, in which it is regarded as a specific. It is also a valuable tonic. Quinine is one of the five most important of the 21 alkaloids obtained from the bark of the cinchona-tree (Peruvian bark; see Bark, Peruvian); the others being quinidine, cinchonidine, cinchonine and hydroquinine (q.v.). The curative power of these alkaloids is accurately shown by the report, dated April 1868, of a commission appointed by the British Indian government (Madras) after the suggestion of Clements R. Markham, C.B., F.R.S. Cases of fever numbering 2,472 were treated, and the result showed failures per 1,000 as follows: Quinidine, 6; quinine, 7; cinchonidine, 10; cinchonine, 23. Quinine alkaloid is seldom used, as it is very insoluble (59° F., 1,600 parts water). The salt known as quinine sulphate $(C_{20}H_{24}N_2O_2)H_2SO + 7H_2O_3$ is generally in use but the acid hydrochloride (also called the «chlorate») is preferred by careful practitioners; and the tannate for children and the more susceptible, in doses two to three times as large.

The average dose of quinine sulphate for adults in the United States is four to five grains every three or four hours beginning a few hours after a paroxysm and continuing until three hours before another is due, when a much larger dose is given. If, as is to be expected, no paroxysm occurs, the treatment is renewed for some hours on the second day, and then again on the ninth day, which completes the cure. In warmer and more fever-ridden countries, twice to three times this amount is given. Quinine is also used with great success as a prophylactic. Since 1902 it has been distributed free by the Italian government in the malarial sections. The preventive amount for adults is five to seven grains of the sulphate per day divided into two doses. Children receive two to three grains daily during the malarial season. As a tonic the best results are obtained by doses of one-half grain of the hydrochloride twice daily. In the administration of quinine it has been repeatedly noticed that toxic symptoms have been developed in some cases; and investigations have shown that in certain conditions both cinchonine and quinine develop poisonous isomeric forms, known as cinchotoxine and quinotoxine. This change takes place in the preparation of quinine when the heating at 212° is prolonged and acetic acid is present. The same changes have been noted at the temperature of the body in the presence of such acids as are sometimes found in the digestive tract, particularly acetic and citric acids. The poisonous symptoms are sometimes severe, and such patients should be treated with quinidine (q.v.). The average consumption of quinine sulphate in the world is 15,000,000 ounces a year, and the approximate average net cost of production is 18 cents per ounce. The importations into the United States in the fiscal year ended 30 June 1918 were 3,273,628 pounds of cinchona and other quinine-yielding barks, valued at $810,775, and capable of supplying an average of 4 per cent (2,095,122 ounces) of quinine sulphate; and 1,445,702 ounces of quinia sulphate and other alkaloids and salts of cinchona bark, valued at $656,945.

To manufacture quinine, the bark is ground to a No. 70 powder (screens of 70 meshes to the inch), and mixed with one-third its weight of slaked lime, made into a paste with water and dried thoroughly at 212° F. It is then powdered and mixed with petroleum and boiled about five hours, the alkaloids in the bark dissolving in the oil, or amyl alcohol may be used for the solvent. The powder is then allowed to settle, and the oil is drawn off and agitated with hydrochloric acid. The alkaloids in mixture known commercially as quinoidine, now leave the oil and go to the acid-water, in which they are more soluble than in the oil. The oil and water separate upon standing, and the acid water is drawn off and neutralized with an excess of ammonia or soda, when the quinine and other alkaloids are precipitated together. The alkaloids are redissolved in very dilute sulphuric acid and then the solution is almost but not quite neutralized by very dilute soda solution cautiously added. It is then heated to the boiling point, and enough boiling water added to make 70 ounces of water for each ounce of mixed alkaloids. Upon cooling, crystals of quinine sulphate are thrown out, leaving the other alkaloids in the solution — called the mother-liquor (see QUINIDINE). The quinine is purified by recrystallizing several times from its solution in water at 212°.

**History.**— The virtues of the bark of what was afterward known as the cinchona-tree were discovered by the Jesuits in Peru about the year 1600. Prior to that date the Indians evidently knew that it had remedial powers, but they did not use it to any extent. In 1638 the Countess of Chinchon, whose husband, Don Luis Geronimo Fernandez de Cabrera Bobadilla y Mendoza, was viceroy of Peru, was cured of an intermittent fever by the use of this bark administered by her physician, Don Juan de Vega, on request of Don Francisco Lopez de Cañizares, corregidor of Loxa. Upon her return to Spain in 1640 the countess carried a supply of the bark with her, and through her it became known to the world. It was very fitting that 100 years later Linnæus should name the genus of trees bearing this bark for the countess — *Cinchona* (Linnæus erred in spelling; it should have been *Chinchona*).

The actual discovery and isolation of quinine is to be ascribed to the French chemists Pelletier and Caventon in 1820, although Gomez, a Portuguese, succeeded in isolating the febrifuge principle, which was practically quinine, in 1816. Sulphate of quinine was first made in America in 1823, and the house of Powers and Weightman, which was founded five years before this date, was undoubtedly the first to manufacture it for sale. Until about 1850 the only source of supply was found in the trees growing wild on the eastern slopes of the Andes from Colombia southward to Bolivia, and as quinine had become so valuable a remedy the world over, the native forests near enough to shipping ports to be economically available were almost exhausted so great had become the demand, for cinchona bark. The price had reached about $20 per ounce. The Dutch, knowing that they had in Java the soil, climate, altitude and temperature almost identical with those in the Peruvian Andes, determined to secure trees or seeds and try to cultivate it there. (Cinchona requires an altitude of 5,000 to 7,000 feet, tropical temperature, without much variation, from 100 to 200 inches of rain a year, and a volcanic soil). The British government made the same attempt in India, but with poor results, because the same conditions of soil and rain do not prevail; and after about 50 years' endeavoring to raise cinchona in India and Ceylon, there only remain a few gardens owned by the government, the product of which is consumed in the army and among the natives, to whom it is sold through the post office at cost. The variety *Cinchona succirubra,* yielding cinchonidine, succeeds well in India.

The Dutch experiment, however, proved to be very successful and remunerative, although it involved almost insurmountable obstacles, loss of years of time and lives of earnest working scientists. The trees now thrive better even than their Peruvian ancestors, for the congenial environment found in Java, together with the methods of cultivation discovered by the Dutch, the most faithful of whom has been Van Leersum, government director of Cinchona undertakings, gave yields of as high as 10 per cent quinine sulphate, while an average of 2 to 5 per cent was a fair yield of the Peruvian trees. The annual average export of the Java plantations is 16,500,000 pounds of bark.

There are now thriving plantations in Bolivia and Colombia and Ecuador as well as in Peru, and with the modern methods of stripping the bark have met successfully the competition of the Java product. Consult McGilchrist, A. C., 'Quinine and Its Salts' (Calcutta 1911); United States Public Health Service Report No. 175, 'Quinine Prophylaxis for Malaria' (Washington 1914).

**QUINISEXT COUNCIL,** or **COUNCIL IN TRULLO,** council of bishops held (692) in the hall named Trullus of the imperial palace at Constantinople. The design of this council was to supplement the purely doctrinal canons of the fifth general council (553) and of the sixth (660) with canons regulating discipline; for this reason it has been called in Latin, Concilium Quinisextum (Latin, *quintus,* fifth, and *sextus,* sixth), and in Greek Synodos Penthektē (Greek, *pente,* five; *hektos,* sixth). It was attended by 211 bishops, all Oriental, and its decrees have ever been repudiated by the Western Church. Among the rules of discipline enacted by this council is one declaring married men eligible to the orders of subdeacon, deacon and priest, but forbidding the marriage of one who is already in priest's orders.

**QUINNAT SALMON.** See Salmon.

**QUINNIPIAC** («long water land»), an Indian tribe of the Algonquin linguistic stock, and probably forming a part of the Wappinger group, formerly residing on Quinnipiac River, New Haven County, Conn. Their principal village was on, or near, the present New Haven. In 1638 they numbered about 165; in 1735 they had increased to 250; in 1768 some of them moved to Farmington, where land was bought for them; in 1774 the original settlements were reduced to 38 natives.

**QUINOA,** kē'nō-ạ, an annual herb (*Chenopodium quinoa*) of the order *Chenopodiaceæ.* It is a native of the Chilean and Peruvian Andes and extends intermittently to Mexico. It grows about three feet tall, bears triangular leaves, very inconspicuous greenish flowers and large seeds. In general the plant resembles the common lamb's quarters or goosefoot (*C. album*), a well-known weed in American gardens. In South America and to some extent in Europe the plant is cultivated for its seeds, which are nutritious and are made into meal or fed to poultry. Its young tender foliage is also used like spinach, a related plant. Since it is a favorite food of certain insects it has not been profitably cultivated in California, where it was tried.

**QUINOLINE, CHINOLIN, LEUCOLINE,** $C_9H_7N$. Runge (1834) isolated at a high boiling point an oily basic substance from coal tar to which he gave the name «leukol.» Gerhardt (1842) obtained an oil by distilling quinine or cinchonine with caustic potash. He called it quinolein from its relation to quinine, but later the name was changed by Wöhler to quinoline. Hofmann (1843) showed that leukol and quinoline were identical. It occurs also in bone-oil and the tar from brown coal, strychnine and other plant alkaloids give it with caustic potash. As usually made in quantity by the interaction of 60 parts glycerine, 50 parts sulphuric acid and 19 parts aniline, which mixture, after heating, is added slowly to 12 parts of nitro-benzine and the whole boiled for about two hours, or until the reaction is complete. The nitro-benzine remaining unchanged is removed by blowing a current of air through the mixture, and this is made alkaline by adding caustic soda. It is then distilled with steam which carries over crude quinoline with some admixture of aniline. The latter is removed by fractionation and the quinoline is further purified by oxidation with the dichromates. Quinoline, when pure, is an oily liquid, with a specific gravity of 1.095 and a boiling point of 460° F.; at first colorless, but becoming dark on exposure to the air; possesses a penetrating, disagreeable odor; is slightly soluble in water and has strong antiseptic properties. It absorbs moisture from the air readily, forming the hydrate. It is a basic substance, forming soluble and easily crystallizable salts with acids. It is used to some extent in medicine and the arts as an antiseptic, its action being to prevent putrefactive fermentation but not to interfere with alcoholic fermentation. It is used as a throat wash in diphtheria, but has not displaced iodoform in surgical dressings. It gives rise to many compounds used in the manufacture of dyestuffs.

**QUINONE,** *in chemistry,* a class name which is applied to organic substances derived from aromatic compounds by the replacement of two «ring» hydrogen atoms by two oxygen atoms. All the compounds of this class are colored and give colorless hydroquinones when reduced. Most of the quinones have the oxygen atoms in the «para» relations to each other. A few «ortho» quinones are, however, known. The simplest and first known of this class is ordinary quinone or benzoquinone, $C_6H_4O_2$; obtained by oxidation of quinic acid, but now usually prepared by electrolytic oxidation of aniline with a mixture of dilute sulphuric acid and potassium bichromate. Its long golden yellow prismatic crystals possess a peculiar pungent odor, and stain the skin yellow. Soluble in hot water or alcohol, they are volatile with steam and turn dark on exposure to the air, from which they absorb oxygen. On reduction it gives hydroquinone, $C_6H_4(OH)_2$, a soluble colorless crystalline body that is used extensively as a photographic developer. Quinone is a very active chemical substance, forming a large number of derivatives of economic interest chiefly in the manufacture of dyestuffs. Another very valuable member of this class is anthroquinone, $C_6H_4C_2O_2C_6H_4$, a yellow crystalline body obtained by oxidation of anthracene. Related to it and obtained from it is the very valuable dye alizarin, the substance to which madder owes its value as a dyestuff. See Alizarin; Hydroquinone.

**QUINONE-IMIDE DYESTUFFS.** See Coal-tar Colors.

**QUINQUAGESIMA,** kwĭn-kwạ-jés'ĭ-mạ, **SEXAGESIMA, SEPTUAGESIMA,** the first, second and third Sundays before Lent. The words mean, respectively, 50th, 60th and 70th, and in the Roman calendar the names of the three Sundays are *Dominica Quinquagesimæ, D. Sexagesimæ* and *D. Septuagesimæ,* respectively. The use of the words is ancient, dating at least from the 7th century, but their meaning is obscure. Alcuin (9th century) suggested the numeration of 70 days from *Dominica Septuagesimæ* down to *Pascha Clausum,* the octave of Easter; but that leaves the other two names unexplained. Another explanation offered by Alcuin was that these two names are formed on the analogy of *Quadragesima* (Lent), being one and two weeks before the first Sunday in Lent: a false analogy, which assumes seven to be equal to 10; but false as it is, it led to calling the second week of Lent *Tricesima* (30th) and the third *Vicesima* (20th).

**QUINQUARTICULAR CONTROVERSY.** See Arminianism.

**QUINSY,** an acute inflammation of the tonsils; acute parenchymatous tonsilitis. It is attended by fever, pain, headache, difficulty in swallowing (dysphagia), and frequently by suppuration. One attack seems to predispose to another. It is not uncommon for individuals to have attacks year after year at about the same time of the year. Disturbances of the digestive organs — diarrhœa, constipation, loss of appetite, nausea, vomiting, etc., are predisposing causes. Sudden changes of weather, exposure to damp and cold, especially after coming out of a heated room, are exciting causes.

Quinsy sets in with an uncomfortable feeling in the throat, and fever sometimes high, preceded at times by chilliness. The patient is restless and irritable, the tongue becomes covered with a thick yellowish coating, the breath is unpleasant, saliva drools from the mouth, there is difficulty in opening the mouth, swallowing is attended with great effort and pain and sometimes food returns through the nose. Pain may be severe most of the time, shooting toward the ear upon the affected side. Swelling externally behind the ears and involving the glands of the neck may be marked. A thick tone of the voice, thirst, headache, snoring and dryness of the throat are common symptoms. Sometimes breathing is impeded, especially if both tonsils are involved. On examination of the throat one or both tonsils are seen to be bright red and sometimes covered with patches of yellow secretion. The soft palate is red, greatly swollen and œdematous, as is also the uvula, which not infrequently adheres to the tonsil. Quinsy may terminate either in resolution or suppuration. If resolution is to take place, in about four or five days the inflammation begins to subside, and the patient in from 10 days to a fortnight may resume his ordinary employments. If suppuration is to occur, the tonsilar swelling becomes greater, and if both tonsils are inflamed they may meet, causing great discomfort. When pain and discomfort become almost unbearable, an inflamed tonsil generally breaks and great relief and speedy convalescence follow.

Occasionally, if the disease is taken at the outset, it can be absorbed by a saline purgative or an emetic and the use of one or two drops of tincture of aconite every hour. If it continues in spite of early treatment, it will probably run its course, though much can be done to palliate. Keep the patient quiet (sometimes in bed), and give hot or cold liquid foods, whichever he can swallow best. Washing out throat with hot water every hour may be comforting, as also may inhalations of the steam of hot water, cooled by passing through a towel or a long tube. Saline laxatives are useful; so are hot compresses about the neck. Ice and cool drinks have an efficacious value. Local applications and the use of medicines and stimulants should be left to the judgment of the physician. Abscesses should be opened (not left to mature) and astringent gargles afterward used. Diseased tonsils should be excised.

**QUINTAIN,** an apparatus used in a military sport or exercise by men on horseback, formerly practised in England to try the agility of the country youth. The quintain was an upright post with a cross-bar on the top of it, turning round on a pivot. To one end of the bar was suspended a bag of sand, the other end was broad and flat. The horseman had to ride tilt at the flat end with his lance and endeavor to strike it and pass on before the bag of sand could whirl round and strike him on the back.

**QUINTAL,** a weight of 100 or 112 pounds, according to the scale used. See Weights and Measures.

**QUINTANA,** kēn-tä'nä, **Manuel José,** Spanish poet: b. Madrid, Spain, 11 April 1772; d. there, 11 March 1857. He was educated in the University of Salamanca, studied law, engaged in practice at Madrid, where he occupied several government offices, and soon turned his attention to literature. He was author of almost all the manifestos and proclamations issued in the War of Independence and his patriotic poems soon won for him great popularity. He edited the journal *Variedades de Ciencias, Literature, y Artes,* founded the *Semanario Patriotico* and urged upon the people the necessity of resisting Napoleon. After the restoration he was imprisoned in 1814–20, and then was released by the revolution. He lived in retirement from 1823 until 1833 when he was appointed preceptor to the infant queen, Isabella, and president of public instruction. In 1835 he was elected senator and was afterward highly esteemed at court. He was one of the leading poets of his time, attaining a European reputation. As a historian he is well known by his ‹Vidas de los Españoles célebres› (1807–34). His complete works are published in Rivadevieyra's ‹Biblioteca de autores españoles› (Vol. XIX, 1852), and by Rojas (1897–98).

**QUINTET,** a musical composition for five instruments or voices, accompanied or unaccompanied. (1) Quintets for stringed instruments have been written much less frequently than quartets, by reason of their complexity. Boccherini, nevertheless, wrote 125. Among famous string quintets are Beethoven's two in C and E flat, Mendelssohn's in B-flat and Schubert's in C. There are various quintet combinations, including brass and wood-wind, as Mozart's in E-flat for oboe, clarinet, horn, bassoon and piano. (2) Vocal quintets are also rare, but very effective. The most notable modern example occurs in Wagner's opera of ‹Die Meistersinger.›

**QUINTILIANUS,** kwĭn-tĭl-ĭ-ā'nŭs, **Marcus Fabius,** Roman rhetorician: b. Calagurris (Calahorra), Spain, about 40 A.D.; d. about 118. He was educated at Rome, where he studied under Domitius Afer, and about 69 began to practise as an advocate. Subsequently he became a teacher of rhetoric, and had Pliny the Younger and the two grandnephews of Domitian as pupils. Domitian bestowed on him the consular rank, and under the endowment of Vespasian he was the first public instructor to be paid from the imperial treasury. His first important treatise, ‹De Causis Corruptæ Eloquentia,› is no longer extant. His great work, ‹De Institutione Oratoria› (12 vols.), was written about 93, and embraces a statement of his theory of education together with a discussion of the principles, scope and matter of oratory; also its manner under the general term style. (See Institutes of Oratory). The best editions of Quintilian are those of Burmann (Leyden 1720), Capperonier (Paris 1725), Gesner (Göttingen 1738), Spalding and Zumpt (Leipzig 1798–1829) and Halm (1868–69). There are also special editions of the 10th book, among which are those of Bonnell (1851), Kruger (3d ed., 1888), Peterson (1891); this book criticizes Greek and Latin literature, from the point of view of the orator, and its usefulness in forming a vocabulary. The work as a whole is remarkable for its perspicuity and well-balanced judgment, as well as for the beauty of its graceful diction. From the 15th century, when the manuscript was first discovered, Quintilian was considered the standard authority on classical education throughout the Renaissance period in Europe. The effect of his system is still recognizable in the curricula of classical schools. Consult Schanz, M., ‘Geschichte der römischen Literatur’ (Munich 1913); Woodward, T. H., ‘Education During the Age of the Renaissance’ (Cambridge 1906).

**QUINTILIUS**, kwĭn-tĭl'ĭ-ŭs, **Aurelius Claudius**, Roman emperor, 270 A.D. He was a brother of Claudius II and at the latter's death was elevated to the throne, but as the army of Sirmium had elected Aurelian emperor, Quintilius, seeing himself deserted by his followers, committed suicide. He seems to have been a man of unblemished character and to have possessed the high attributes of his brother. The length of his reign is usually placed at 17 days, but the large number of his coins extant indicates that he held the office for some months.

**QUINTUPLE ALLIANCE.** See QUADRUPLE ALLIANCE.

**QUINTUS CALABER**, or **SMYRNÆUS**, Greek poet: belonging probably to the end of the 4th century A.D. His surnames are derived from the discovery of his poem in Calabria (in a convent at Otranto), and his mention of Smyrna as the place of his residence. His poem, *Παραλειπόμενα Ὁμήρω* (‘Supplement to Homer’), is a continuation of the ‘Iliad,’ in which he imitates, with very little originality, the poets of the epic cycles. A critical edition of this, by Tychsen, with remarks by Heyne (1807), was published by the Bipont Society. There is also an edition by Köchly (1853), and Zimmerman (1891). Consult Paschal, G. W., ‘A Study of Quintus Smyrnæus’ (Chicago 1904); also Christ-Schmid, ‘Geschichte der griechischen Literatur’ (Vol. II, Pt. 2, Munich 1913).

**QUINZE JOYES DE MARIAGE**, kăṅz' jwä dĕ mä'rĭ-äj, **Les** (the 15 joys of marriage), a famous French satire usually credited to Antoine de La Sale and written between 1448 and 1456. The title was borrowed from a popular litany, ‘Les Quinze Joiés de Notre Dame,’ its profanity being in keeping with the lack of humane or moral sentiments in the satire. However, its wit and masterly style are unquestionable. A chapter is devoted to each of the 15 «joys» which are made to designate the miseries of husbands. Consult Jannet, P., ‘Les Quinze Joyes de Mariage’ (1857); Henckenkamp's edition (Halle 1901).

**QUIRINAL**, one of the hills of Rome, not included in the ancient Septimontium, or «City of the Seven Hills,» but part of the four regions of the city, and included in the Servian Wall. Next to the Palatine and Capitoline, it is the oldest and most famous part of the city. The temples of Flora, Salus and Quirinus were on the Quirinal and also the baths or the great thermæ of Diocletian and Constantine. Pope Gregory XIII began here the erection of a summer residence which was completed by Paul V. Victor Emmanuel took possession of it in 1870, and it has since been the residence of the king of Italy. One of the principal treasures of the palace is the ceiling decoration of one room,— painted by Overbeck. The subject is ‘The Flight of Pius IX in 1848.’ Other treasures are an ‘Annunciation’ by Guido Reni, and several other works of art. (See ROME). Consult Baedeker, K., ‘Central Italy and Rome’ (15th Eng. ed., Leipzig 1909) and Platner, S. B., ‘The Topography and Monuments of Ancient Rome’ (2d ed., Boston 1911).

**QUIRINUS**, kwĭ-rī'nŭs, Roman deity, ranking next to Jove and Mars. His origin appears indistinct, but he is represented as a war god prepared for battle in times of peace. The third great flamen was assigned to his worship and his temple stood on the Quirinal Hill near the Porta Quirinalis. He was honored by the Colline Salii and a new building was erected in his honor 293 B.C., which after its destruction by fire was replaced with an imposing structure by Augustus 16 B.C. In the 1st century B.C., however, the belief that Quirinus was Romulus raised to the rank of a divinity gained credence and this opinion was favored by Cæsar and Augustus. His annual festival was celebrated on 17 January, the date of the supposed translation of Romulus to heaven. Consult Fowler, W. W., ‘Roman Festivals’ (London 1899) and Wissowa, Georg, ‘Religion und Kultus der Römer’ (Munich 1912).

**QUIRINUS, Publius Sulpicius** (Gk. form CYRENIUS), named in Luke ii as governor of Syria. According to Tacitus he was elected consul in 12 B.C; accompanied Gaius Cæsar as tutor in the East in 2 A.D.; and was appointed to make a census of the newly annexed district of Judæa, an innovation in that country. The difficulty in reconciling the date of this census with the historical facts concerning the birth of Christ has excited considerable controversy. Consult Cheyne and Black, ‘Encyclopedia Biblica’ (London and New York 1903).

**QUIRITES**, kwĭ-rī'tēz, originally the inhabitants of Cures, a Sabine town, and a name afterward applied to that portion of the Sabines who at an early period dwelt in Rome. «Quirites» being applied to them in their civil capacity, while «Romani» was applied to them in their political and military capacity. On this account it was regarded by the soldiers as a great indignity to be addressed as «Quirites,» and Julius Cæsar on one occasion quelled a rising mutiny among his troops merely by scornfully haranguing them under the appellation of «Quirites.» But the contumelious sense of this name had banished before the time of the Augustan Age.

**QUIROGA**, kē-rō'gä, **Juan Facundo**, Argentine politician and soldier: b. Rioja, Argentina, 1790; d. in the barranca of Yaco near Cordova, Argentina, 1835. He was educated in Spain and, on his return to Argentina, he became a soldier in the army of General Ocampo (1810). Later he joined the Army of the Andes, from which he deserted because he did not find conditions to his liking. He seems to have led a wild life and to have been so addicted to gambling that he frequently found himself penniless. Finally he was arrested in 1818 on a charge of treason and imprisoned with a common herd of Indians and half-breeds in the fortress of San Luis. There is organized the prisoners, among whom were a number of officers and soldiers, broke out of the prison and led them to the mountains where he was received as a hero by the natives of the interior. He organized a band of rude soldiery which made him practically the ruler of northeastern Argentina in 1820. In 1827 he appointed a governor of La Rioja, secured the election of Dorrego as President and, though defeated by General Paz in 1830, became governor of Buenos Aires in 1834. He was assassinated in the following year. He was a man of very strong will power and his ascendency over his followers was perhaps greater than that of any other leader of his country at that time.

**QUIROGA, Vasco de,** Spanish-Mexican prelate: b. Madrigal de Castilla la Vieja, about 1470; d. Uruapam, Mexico, 14 March 1565. He was graduated in law from the University of Valladolid, and owing to his brilliant scholastic record, his success in his profession and his influence at court, he was appointed oidor of the audencia of Mexico. He arrived in the capital of New Spain in 1531, 10 years after the fall of the empire of the Aztecs and while the conquest of a considerable part of modern Mexico still remained to be effected. Quiroga, in a very troublesome age, surrounded by the turbulent soldiers of the Conquest and the unscrupulous adventurers who accompanied or followed them, performed his part in the government of New Spain with justice and firmness and gained the respect of Spaniard and native alike. After six years' residence in Mexico, during which he had gained a vast experience of the country, he was appointed bishop of Michoacan, the ancient kingdom of the Tarascans, with official residence at Pátzcuaro (1537). There he interested himself in the welfare of the Indians, founded the College of San Nicolás and a girls' school; translated doctrinal works into the native tongue and has left a volume of sermons and numerous other works of great interest to the student of this early period in the history of Spain in America. At the age of 95 Quiroga was still actively at work, when he took sick and suddenly died while on one of his pastoral visits.

**QUIT and GOAL,** *in astronomy,* two terms introduced by Prof. H. A. Newton of Yale University to define the two points opposite each other in the heavens toward one of which the earth is at the time moving in its orbit round the sun and from the other receding.

**QUIT-CLAIM,** *in law,* a deed of release; an instrument by which some claim, right or title, real or supposed, to an estate, is relinquished to another without any covenant or warranty, express or implied. See DEED.

**QUITCH.** See COUCH GRASS.

**QUITMAN,** kwĭt'man, **John Anthony,** American statesman and soldier: b. Rhinebeck, N. Y., 1 Sept. 1799; d. Natchez, Miss., 17 July 1858. He studied law and in 1821 removed to Natchez, Miss., where he established a successful law practice. He was elected to the legislature in 1827; was chancellor of the Superior Court of Mississippi in 1828–31 and 1832–34. He was president of the State senate in 1835; in 1836 served as ex officio governor of the State and in 1839 was judge of the High Court of Error and Appeals. Interested in the cause of Texan independence he labored earnestly in its behalf. At the outbreak of the Mexican War he was made brigadier-general of volunteers. He distinguished himself in various battles of the Mexican campaign; was promoted major-general of volunteers and received from Congress a sword and a vote of thanks. He was appointed governor of the City of Mexico by General Scott and on his return was elected governor of Mississippi in 1850, which office he resigned the following year when accused of complicity in the Lopez-Cuban expedition, a charge of which he was acquitted. In 1855–58 he served in Congress, where he was an ardent supporter of States rights. Consult Claiborne, 'Life and Correspondence of John A. Quitman' (1860).

**QUITMAN,** Ga., city and county-seat of Brooks County, 50 miles northeast of Tallahassee, Fla., near the southern border of the State, on the Atlantic Coast Line and the South Georgia and West Coast railroads. It is situated in an agricultural district and produces large quantities of hams and bacon, as well as stock and cotton. There is also a lumber industry. Pop. (1920) 4,393.

**QUITO,** kē'tō, capital of the republic of Ecuador, situated only a few miles south of the equator, but at a height of more than 9,000 feet above sea-level. Climatic results of proximity to the equatorial line are modified and nearly equalized throughout the year by those of altitude; the temperature is, therefore, spring-like. It is, however, an inaccessible inland place; until 1903 (see ECUADOR) neither railway nor highway connected it with the seacoast. A part, at least, of the journey to Guayaquil, 165 miles away, was usually made on mule-back, along a mere bridlepath which crossed the breast of Mount Chimborazo at a height of 14,000 feet; and the rare action of the atmosphere at that altitude can seldom be supported without discomfort. For the transportation of freight from the port to the interior two or three weeks have hitherto been required. Owing to its remoteness and the lack of highways, the city is visited by few strangers, and has no good hotels, no carriages or wagons. Yet the streets are lighted by electricity, and the list of public institutions devoted to education, the Roman Catholic Church and the government is quite impressive, including an astronomical observatory, botanical garden, school of agriculture, and other adjuncts of a «central university,» with faculties of *belles-lettres,* science, law and medicine. The architecture in general is that of a country subject to earthquakes — low and substantial. Features deserving special mention are the beautiful park called the Alameda, and the Sucre Theatre. The estimate of population (probably much too liberal) in semi-official publications is 70,000. It was originally the central town of an ancient Indian nation. In 1470 it was captured by the Incas, who in turn surrendered it to the Spaniards in 1534. During the Spanish rule, it was the capital of the presidency of Quito. Frequent earthquakes have demolished the town, the last having occurred in 1887. See also ECUADOR, *History*.

**QUIVIRA**, kē-vē'rä, a «province,» reputed to have been populous and rich in gold and other things, of which Francisco Vasquez Coronado, the Spanish explorer, received news from a plains Indian, known as the «Turk,» while in winter quarters on the Rio Grande in New Mexico in 1540–41. Coronado started from Pecos pueblo in New Mexico, with his army, guided by the «Turk,» in the spring of 1541, and after long wandering over the buffalo plains of Texas sent the larger part of his force back to New Mexico and continued his journey due northward for 35 or 40 days, encountering the first settlement of Quivira about the present Great Bend, Kan. The province was found to consist merely of a group of villages, composed of grass lodges and inhabited by a tribe, recently identified as the Wichitas, which raised corn and hunted the buffalo. Coronado put the «Turk» to death, and after exploring the country for several months returned by a more direct route to New Mexico. Coronado's disappointment having become forgotten, the name Quivira lingered in the minds of later Spanish explorers of the southwest and grew to be the watchword of an unexplored Eldorado. After the abandonment of the Indian pueblo of Tabirá, in eastern New Mexico, about 1675, the idea of Quivira and its supposed wealth was transferred to the ruins of the New Mexico village, and the name «Gran Quivira,» then applied to it, has since been popularly retained. Consult Hodge, 'Coronado's March to Quivira,' in 'Brower's Memoirs of Explorations in the Basin of the Mississippi' (1899).

**QUIXOTE, Don.** See DON QUIXOTE; CERVANTES.

**QUO VADIS.** Sienkiewicz, early in the nineties of the last century, devoted himself to a study of the Latin writers of the first few Christian centuries and the result of these studies was 'Quo Vadis,' a historical novel of the time of Nero, which appeared in 1895 and immediately created a sensation throughout the world. By 1900 nearly 2,000,000 copies of the English translation, made in 1896 by Jeremiah Curtin, were sold, and in France, Italy and America there appeared dramatizations of the story. The author's realistic treatment of the early Christians provoked heated discussions in the Catholic Church of Poland and an attempt was made to prohibit the reading of the novel, but elsewhere it was received with undivided enthusiasm. In Genoa it was, in 1899, made the subject of a social study by Semeria, 'L'arte e l'apologia cristiana,' in connection with the Superior School of Religion. In spite of some historic crudities, he proclaimed it a chef d'œuvre of Christian art. The chief merit of the story consists in the ever-present contrasts between voluptuous and cruel Rome on the one hand and the meek spirit of the dwellers in the Catacombs on the other, which makes the characters appear in far greater relief than in Cardinal Wiseman's 'Fabiola' or in similar stories by Cardinal Newman and Canon Farrar. Thus Petronius, the Stoic and Sybarite, representing the over-refinement of antiquity and his Greek slave, Eunice, who passionately clings to him unto death, are contrasted with the pagan, Vinicius, and his Christian bride, Lygia; the royal performer in the circus is opposed to the fisherman who shall rule over the world; the trickster, Chilon, is brought in contrast with the meek «forgiving Christian, Glaucus.» Over all of them, representing the struggle of two worlds, stand Nero and Saint Peter, the first laboriously limned in his moral degradation, thirsting for new impressions, no matter at what cost of human lives, the other, expressing himself in the fewest of words, which bear witness to the coming victory of the new Church over the ancient world. Among the numerous criticisms of 'Quo Vadis,' the most elaborate is that by Tarnowski, in his 'Studya do historyi literatury polskiej' (1897, Vol. V, pp. 268–344).

LEO WIENER.

**QUO WARRANTO,** *in law*, a writ issued by a court to a person commanding him to show «by what warrant» he holds an office, franchise or the like. The writ originated at an early date in England, where it has been much modified by statute and is now called an information in the nature of a quo warranto. Though nominally a criminal writ, it has for a long time been considered a civil writ and has in recent years been judicially declared in England to be such. It may be brought in England, on leave of court, by a private person.

In most jurisdictions in the United States it is brought by the attorney-general of the State either officially or in the name of a private person. In some States, as New York, statutory actions in the nature of a quo warranto have been substituted for it. Quo warranto proceedings may be instituted against municipal corporations, but in practice it is seldom done. It has been held that this writ may be used against militia officers, sheriffs, school trustees, lieutenant-governors, mayors and other municipal officers, but not against policemen. Another important use of quo warranto is to determine whether there has been a non-user or misuser of a franchise of a corporation.

**QUODLIBET,** (1) a form of scholastic argument in use in the 13th and 14th centuries, which might be founded on any subject, but was usually theological. The discussion was of an elaborate and subtle form and about a dozen books of quodlibets written between 1250 and 1350 are in existence. (2) *In music* the term designates a fanciful or humorous combination of well-known melodies, sometimes known as a «Dutch concert» and popular in German student gatherings. The diversion consists of the singing of familiar melodies and upon coming to a word which forms the first word of another song transferring without a pause to its words and music until another word gives occasion for another change.

**QUOIN,** koin (French, *coin;* Latin, *cuneus,* a wedge), a technical word for a wedge; (1) in artillery, the wedge used to elevate and de-press a cannon or other piece of ordnance; (2) *in printing,* the wedge used to fix pages of type within the chase; (3) *in architecture,* the term is applied to any external angle, but especially to the angular courses of stone projecting beyond the plane surface of the wall at the corner of a building and specifically designated rustic quoins.

**QUOITS,** kwoits, a game somewhat resembling the throwing of the discus among the ancients; only the discus was flat, while the quoit is ring-shaped. (See Discus). The quoits are made of metal, usually iron, and are comparatively thick at the inner edge of the ring, but sharp enough at the outer edge to stick in soft clay when properly thrown. In size they vary from eight to nine and one-quarter inches. The game is played on a ground from 18 to 24 yards in length, at each end of which a pin called a hob is fixed in the ground to serve for a mark. The object of the game is to throw the quoits from one end of the ground to the other so as to make them stick in the ground as near the hob as possible. The best shot, called a ringer, is when the quoit surrounds the hob. The players are divided into sides and each player has two quoits, which he delivers in succession. The winning side counts one for each quoit that it has nearer the hob than the nearest of the losing side and if it has a ringer it counts two for it. The rules as to the size of the quoit, the distance between the hobs and other particulars vary with different players. In the United States the game is often played with cast-off horseshoes. The game is popular in England, Scotland and Canada, and in the two latter countries is the summer sport of the curling clubs. In the United States, under the auspices of the Grand National Curling Club of America, there is an annual contest for the Bell quoit medal, given by David Bell of Buffalo, N. Y., in 1868. Consult Spalding's Athletic Library, 'How to Pitch Quoits' (No. 167; New York, published annually).

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**QUORATEAN** (kwō-rä-tē'ạn) **INDIANS,** an American linguistic stock, comprising the Kworatem tribes, from which the stock derives its name. The name was proposed by Gibbs and adopted by Powell. The tribes occupy Lower Klamath River from the mountains a little above Happy Camp to the junction of the Trinity and Salmon River from its mouth to its sources, in northwestern California. See Karok.

**QUORUM,** in old English law, a collective name for those justices of the peace whose presence is necessary to constitute a bench. Also such a number of officers or members of a body as is competent by law or constitution to transact business.

**QVIGSTAD,** kvĭg'stạd, **Just Knud,** Norwegian educator and philologist: b. Lyngen, 1853. He was graduated at the University of Christiania and was rector of Tromsö Seminary for Teachers 1883–1909. He published several works on the ethnography and languages of the Finno-Ugrian and Lappish races, which are international standards. He was minister of public instruction under the premiership of W. Konow from 1909 until 1912, when he resigned to return to his rectorship at Tromsö.

**QVISTGAARD,** kvĭst'gärd, **J. W. von Rehling;** Danish miniature painter: b. Örsholtgaard, parish of Tikjob, 1877. He was graduated at the Royal Agricultural College of Copenhagen and in opposition to family prejudice, as a member of the Danish nobility, selected art as a profession. After a brief course of study in Copenhagen under Johan Rohde, he came in 1901 to the United States, where, although practically self-taught, his original and superior work soon attracted attention. In 1906 he visited London and Paris, and in 1909 by royal command returned to Copenhagen to make miniatures of the king and queen and other members of the royal family. He returned to New York in 1912 where he has since resided. Special exhibitions of his works were held at Ghent in 1913 and New York in 1914, and have been prominent in the principal miniature exhibitions of Europe and America. Notable productions include an oil portrait of Theodore Roosevelt, and miniatures of Mrs. Paul Reinhardt, Mr. and Mrs. Charles M. Pratt, and Dr. George C. Williamson, the well-known expert on miniatures.

# R

**R** the 18th letter of the English and other alphabets derived from the alphabet of the Latins. The corresponding letter of the Greek alphabet, rho, has the form Ρ, ρ, which is the 𐤓 of the ancient Phœnician alphabet, with the loop turned to the right; in some very ancient Greek Italiot inscriptions occurs the form R which was adopted by the Romans. R is classed as a liquid or semi-vowel with *l, m* and *n*. Its normal sound is doubtless either the *trill* produced by vibration of the tip of the tongue raised toward the front palate or the *burr*, which is produced by a vibration of the lower part of the tongue and the uvula; the trill is heard in the speech of the Latin nations — Italians, French and Spanish; the burr in that of the Germans and Scandinavians. In present English speech the *r* is sounded with a very faint trill or quite without a trill, save in the pronunciation of the people of certain counties of England, who produce it with a guttural vibration; in the pronunciation of this letter by the Scotch and Irish the trill is distinctly heard. When *r* begins a syllable and when it follows a consonant — as in *race, trap,* it is distinctly a consonant; but in other situations, as in *nerve, hard, never,* it is really a vowel sound. This vowel sound is related to the vocalic *r* of Sanskrit and the Slavic languages. In the faulty or affected pronunciation of certain classes *r* becomes equivalent to *w,* for example, *vewy* for *very.* The two liquids or semi-vowels, *r* and *l,* are sounded when the voice is modified by certain positions of the tip of the tongue relatively to the front palate; hence the two letters are freely interchanged between one language and another and within the vocabulary of one language; Spanish *azul* is English *azure;* from *parabola* comes, indirectly, *palaver.* There are races or peoples who are unable to pronounce the *r* with either the trill or the burr or even with the slight vibration heard in English speech; in such case *l* takes the place of *r.* Besides the dental or trill *r* and the vocalic *r,* the Sanskritic languages and certain others have a cerebral *r* formed by the tongue-tip against the hard palate. When in Greek a word or syllable begins with *r* that *r* is always aspirated, as is the second *r* when *r* is doubled, and the ancient Romans represented this aspiration by inserting *h* after the *r;* this *h* we retain, though we recognize no difference between the *rh* of *rhabdomancy* and the simple *r* of *rabid.* In many English words the *r* found in their Anglo-Saxon originals is dropped; for example, *sprӕcan* becomes *speak;* on the other hand, we insert *r* in words which in their ancient form were without it; for example, Anglo-Saxon *brydguma* becomes *bridegroom;* and French *cartouche* becomes *cartridge.* R stands for «royal» in many abbreviations. ℞ in pharmacy stands for *recipet* (take). See ALPHABET.

**RA,** rä. See RE.

**RA-MA'S BRIDGE.** See ADAM'S BRIDGE.

**RAAB,** räb, **Johann Leonhard,** German etcher and engraver: b. Schwaningen, near Anspach, Bavaria, 29 March 1825; d. Munich, 2 April 1899. He was educated at Nuremberg and at the academy in Munich and received an appointment as professor of engraving at the latter place in 1869, which he held until 1895. His work includes engravings after Raphael, Titian, Veronese, Kaulbach, Lessing, Schwind, Ramberg and others, besides a collection of 50 etchings reproduced from the most notable works in the old Pinakothek at Munich. He was a member of various art academies and received gold medals at Paris, Berlin, Vienna and Munich.

**RAAB** (GYÖR, dyėr), Hungary, capital of a province of the same name, situated at the confluence of the Raab with a minor branch of the Danube, the so-called Little Danube, 70 miles southeast of Vienna, a position uniquely advantageous from both a military and commercial viewpoint. Its importance dates from early Roman occupation when it was called Arabona or Rabona. The Turks held it 1594–98. In the 18th and early 19th century it was an important fortress. In 1809 the combined Austrian-Hungarian forces were defeated here by the French troops under Eugene Beauharnais. During the Hungarian revolution it was stormed by the Austrians on 28 June 1849. It is the centre of a number of railroad lines, seat of the provincial authorities and of a bishop, possesses high schools, normal schools and grammar schools, carries on an extensive trade in grain, horses and pigs, and has a number of industrial establishments for the manufacture of machinery, cutlery and oil. The population of the province is about 92,000, that of the city 44,300.

**RAABE,** rä'bĕ, **Wilhelm,** German novelist and poet: b. Eschershausen, duchy of Brunswick, 8 Sept. 1831: d. 15 Nov. 1910, in the city of Braunschweig. After attending the gymnasia in Holzminden and Wolfenbüttel, he entered a book store as apprentice in 1849. He used this opportunity for wide reading and enriched himself with the tales and folklore of his own and other countries. In 1855 he entered the University of Berlin to study the humanities. In the autumn of 1856 appeared his first book, ‘Die Chronik der Sperlingsgasse,’ under the pseudonym Jakob Corvinus. The book, which contains sketches of life among the German bourgeoisie, was very successful and Raabe became well known. Being thus encouraged he gave up his studies and devoted himself entirely to literary work. From 1862 to 1870 he lived in Stuttgart. Then he again returned to Braunschweig and remained active until the end of the century, publishing upwards of 30 novels and a number of short stories and sketches.

His life work may be divided into three periods. During the first he wrote with a light touch, producing a series of pictures of German life from the abundance of his imagination and experience, among which are ‘Die Chronik der Sperlingsgasse’ (1856), ‘Die Kinder von Finkenrode’ (1859) and ‘Unser Herrgotts Kanzlei’ (1862). The influence of the pessimism of Schopenhauer is evident during the second period. Representative works of this period are ‘Der Hungerpastor’ (1864), ‘Abu Telfan’ (1867), and ‘Der Schüd derump’ (1870). These three works are sometimes referred to as a trilogy. While they are independent of each other in substance, they do represent a distinct epoch in the life of Raabe.

During the third period of the novelist's life his works no longer show this pessimistic strain A genial humor pervades them, though they frequently deal with serious subjects. ‘Horacker’ (1876) perhaps best represents this tendency. ‘Der Dräumling’ (1872), and ‘Deutscher Mondschein’ (1873), also come under this head. Of his numerous later works ‘Das Odfeld’ (1889) and ‘Die Akten des Vogelsangs’ (1895) seem to be most read.

Raabe has been continually gaining in the estimation of the German people. This was especially shown at the celebration of his 70th birthday in 1901. He is perhaps the most distinctly German of modern novelists and story writers. There is hardly a situation in the life of the average German that has not been portrayed by Raabe. His early works were influenced to some extent by Jean Paul. Later he also shows evidences of having read Dickens and Thackeray. In 1911 a selection of Raabe's poems was published. Consult Brandes, W., ‘Wilhelm Raabe’ (Wolfenbüttel and Berlin 1906); Gerber, Paul, ‘Wilhelm Raabe, Eine Würdigung seiner Dichtungen’ (Leipzig 1897); ‘Gesammelte Erzählungen’ (2d ed., Berlin 1901); Spiero, H., ‘Wilhelm Raabe’ (Bielefeld 1911).

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**RAB AND HIS FRIENDS**, a short story by Dr. John Brown (q.v), an Edinburgh physician, published at Edinburgh in 1859. Rab's friends are his master and mistress, James Noble, the Howgate carrier, and his wife, Ailie. Perhaps no truer, more convincing dog character exists in literature than that of ugly, faithful Rab. The pathos in the simple lives of himself and his friends is heightened by the tinge of Scotch dialect, as well as by the author's wise self-restraint. It has gone through many editions both in England and in the United States.

**RABANUS**, ra-ba'nŭs, or **HRABANUS, Maurus,** Carolingian prelate: b. Mayence, about 776; d. Winkel, near Mayence, 4 Feb. 856. His education was obtained in the cloister school of Fulda, and later at Tour, where his instructor, Alcuin, surnamed him Maurus after the legendary founder of the order of Saint Benedict in France. He took the Benedictine vows at an early age, was ordained deacon in 801 and priest in 814. He became the head of the school at Fulda, which under his guidance became the most famous monastery school in Germany, and in 822 was elected abbot of the monastery. In 842 he resigned and retired to Petersberg, but came again into public life in 847, when he was elected archbishop of Mayence. He was one of the bitterest of the opponents of the monk Gottschalk, the originator of the predestination controversy in the 9th century. He was one of the most learned men of his time and greatly advanced the spiritual, intellectual, artistic and material interests of his see. His literary activity was considerable, resulting in commentaries on the Old Testament, on the Gospels of Saint Matthew and Saint John and the Pauline Epistles, devotional books, homilies, hymns, polemics and a Latin-German Glossary to the Bible. He also wrote ‘De Universo’ (22 vols.), a sort of encyclopedia. His ‘Opera Omnia’ are comprised in J. P. Migne's ‘Patrologiæ Cursus Completus’ (Vols. CVII–CXII, Paris 1851–52), reprinted from the uncritical edition of G. Colvenerius (Cologne 1626). This edition contains his life by the monk Rudolph, and by Johann Trithemius. His poems have been edited by E. Dümmler in ‘Poetae Latini Aevi Caroline’ (Vol. II, Berlin 1884). His pedagogical writings have been edited in German by I. Freundgen (Paderborn 1889. A. Knopfler has edited his ‘De Institutione Clericorum Libri Tres’ (Munich 1901). Consult Hablitzel, J. B., ‘Hrabanus Maurus’ (Freiburg i B. 1906); Koehler, ‘Rhabanus Maurus und die Schule zu Fulda’ (Chemnitz 1870); Kunstmann, F., ‘Hrabanus Magnentius Maurus’ (Mainz 1841); Richter, ‘Hrabanus Maurus’ (Malchin 1882); Schaff, P., ‘History of the Christian Church’ (Vol. IV, New York 1885); Spengler, T., ‘Leben des Heiligen Rhabanus Maurus’ (Regensburg 1856); Tuernau, D., ‘Rhabanus Maurus, der Praeceptor Germaniae’ (Munich 1900); West, A. F., ‘Alcuin and the Rise of Christian Schools’ (New York 1893).

**RABASA**, rä-bä'sạ, **Emilio**, Mexican lawyer and party leader: b. 1856. He was educated at the University of Mexico, specializing in international law, and has written the best Mexican works on that subject. He was a leader of the Cientifico party in the later years of the Diaz administration, and was subsequently slated for Ambassador to the United States. He was ranking member of the Huerta delegation to the A. B. C. Mediation Conference at Niagara Falls, Ontario, in 1914. He is author of several novels under the pseudonym of Sancho Pola, and of many political treatises, among them ‘La organizacion politica de Mexico’ (1917).

**RABÁT**, rä-bät (Ribát'), or **ARBÁT**, also known as New Saleh, Morocco, in the province of Fez, on the Atlantic Coast, at the mouth of the river Bu Regrag and on its southern bank, 62 miles west of Mequinez. It stands on a rocky plateau and is surrounded by massive reddish-brown fortifications. A conspicuous feature from the sea is the Hasan Tower, a minaret 180 feet high, a remnant of an ancient mosque. Rabát's manufactures are carpets, woolen, cotton and leather goods. The Sallee pirates formerly built their ship at Rabát. It is one of the capitals of Morocco, and the sultan has a palace there in which he resides part of the year. At present it is also the seat of the government and the residence of the French president-general. Although the value of its harbor is decreased by the presence of a dangerous bar, its imports in 1916 were the second largest of all Moroccan ports, amounting to $6,290,000, while its exports in the same year totaled $638,500. It has a post office, telephone, telegraph and wireless station. On the hills west of the town are the ruins of Sala, a Roman colony. Pop. about 37,548, of whom 9,748 were Europeans.

**RABBA,** rä'bä, British West Africa, province of Nupe in northern Nigeria, on the left bank of the Niger, about 200 miles above the confluence of the Niger and Binue. In the early part of the 19th century it was a town of considerable importance, having some 40,000 inhabitants and carrying on an extensive trade in slaves and ivory. By 1867 the African explorer Rohlfo reported that only some 500 people were living there. Since the establishment of British rule it has recovered its former position to some extent.

**RABBI,** a title of honor among the Hebrews; «my teacher,» «master.» John expressly states that the word was equivalent to «teacher» (Greek *didaskalos,* rendered in the Authorized Version «master»; John i, 38). There is another form of title *rabboni,* found in the New Testament. The form rabban, the Chaldaic form of the Hebrew «rab,» was considered the most honorable, and was only applied to seven persons. Rabbi was also looked upon as a higher title than rab. It is supposed that this title first came into use at the period immediately preceding the birth of Christ. In the time of our Lord it was applied generally to all religious teachers, and hence sometimes to Christ himself. Now the term rabbi is applied to regularly appointed teachers of Talmudic Judaism. Since 1831 these have in France been salaried by the state. Their duties are not only to give instruction in the Talmud, but also to draw up deeds of marriage and divorce, to examine butchers and to give their opinion as to what is legal and what is illegal in the Jewish ritual.

**RABBINICAL LANGUAGE AND LITERATURE,** that form of Hebrew in which the Jewish scholars and theologians of the Middle Ages composed their works. See JEWS AND JUDAISM — HEBREW LANGUAGE, JEWISH LITERATURE, ETC.

**RABBINICAL LEGISLATION.** See JEWS AND JUDAISM — THE SPIRIT OF RABBINIC LEGISLATION.

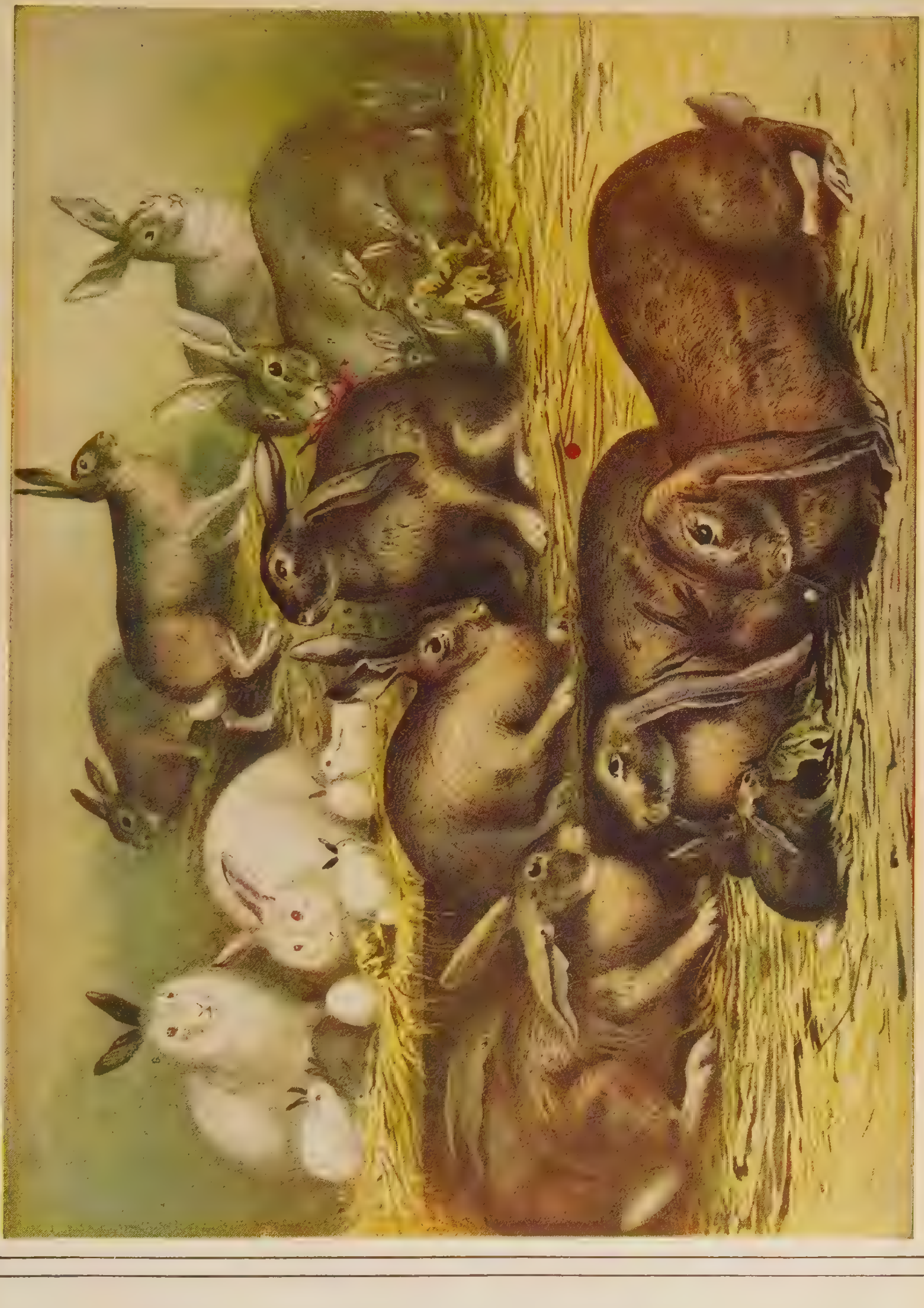
**RABBIT,** a name, when properly used, restricted to a single species (*Lepus cuniculus*) of the rodent family, *Leporidæ,* to which the native American hares (q.v.) also belong. The rabbit is of European origin, and, although found wild in many places, is better known in the domesticated or semi-domesticated state in which it has been introduced into the United States. Although the habits of the rabbit afford the best distinction from the hares, the wild species exhibits some structural characteristics, among which are its generally smaller size, the shorter ears of uniform brown color and the shorter limbs. The hind legs in the hares are proportionally longer than in the rabbits, and the eyes are larger and more prominent than in the latter animal. The face is also narrower and the skull lighter in the rabbit. The rabbit's fur in its native state is of a nearly uniform brown color, while under domestication the color may become pure white, coal black, piebald, gray and other hues. The texture of the fur also changes under domestication.

Unlike the hares, which construct only simple nests or forms, the rabbit lives permanently in underground burrows, large colonies of which are often to be found in some dry sandy bank overgrown with furze or brush, or other similar locality. Such «warrens» are often specially set apart for them in order that they may breed and multiply for the market, their flesh being excellent as food, and their fur and skins of value. The burrows are irregularly disposed, and communicate freely with each other. Rabbits are extremely prolific, and begin to breed when about six months old. They may breed six or eight times a year, producing from five to seven or eight at a birth.

The parturient rabbit excavates a special burrow or tunnel for herself in which to give birth to and shelter her progeny, the nest being lined by down plucked from her own body. The young are hairless when born and have their eyes closed. The eyes open about the tenth or twelfth day. These animals feed on tender grass and herbage, and sometimes do great damage to young trees by stripping them of their bark.

These animals grow exceedingly tame and domesticated, and may exhibit no small degree of intelligence. They are snared, taken by ferrets and nets or may be shot. Rabbits are subject to certain diseases, such as rot, parasitic worms and a kind of madness. The original home of the rabbit is believed to have been those parts of Europe and Africa around the western half of the Mediterranean, where it still abounds, but it is now widely spread throughout temperate western Europe, and has been conveyed by man to such distant lands as Australian colonies, Tierra del Fuego and the Falkland Islands. In Australia and New Zealand it has multiplied so enormously as to have become a serious pest to the colonists, causing immense loss and damage by eating up the pasture intended for sheep and cattle. Various methods of extermination have been tried against them, but as yet none have had more than a moderate success. Large numbers are now killed and exported as food, frozen or otherwise preserved, and millions of skins are annually shipped to Europe and the United States. In some parts of South and Central America, and especially in Jamaica, the domestic rabbit has been introduced and established in the wild state. Darwin records several cases where quite distinct races of rabbits have resulted from their isolation on islands. An Asiatic species (*L. hispidus*) is closely related to the European rabbit, and a so-called tailless rabbit (*Romerolagus*) has been described from the region of Mount Popocatapetl in Mexico. It is peculiar in the possession of well-developed clavicles. All the domestic breeds or rabbits

# DOMESTIC RABBITS.



1. Wild Rabbit. 2, 3. French Rabbits. 4. French Lop-Ear. 5. Norman Rabbit. 6. Angora Rabbit.

appear to have been derived from the feral species of southern Europe; and have been but little influenced by occasional crosses with hares. The Chinese, as early as the time of Confucius, appear to have bred rabbits for sacrificial purposes; and domesticated varieties were mentioned by classical Greek and Roman writers. The most noteworthy change under domestication has been the great increase in size and weight, the latter having been raised from three pounds in the wild rabbit to as much as 18 pounds in the Flemish giant. This variety is bred chiefly for food, but for this purpose is less esteemed than the Belgian «hare,» so-called because of its large size and hare-like color, and the unfounded belief that it originated from a cross between the hare and rabbit. The qualities which recommend the Belgian variety for market breeding are its extreme fecundity, the ease with which it may be kept in confined quarters, its rapid growth, so that it is ready for eating in about four months after birth, and the similarity of flavor of the young to the wild rabbit. A wave of enthusiasm for Belgian hare breeding passed through this country a few years ago, but has largely subsided, though many large rabbitries continue to supply the cities, particularly in the West. Of the purely fancy varieties the lop-ear is the most remarkable; the external ears in fine specimens measure 23 or even 24 inches long and six inches wide. The Angora, which originated in Asia Minor, has the beautiful long, silky white hair peculiar to several animals of that region, and there and in parts of Europe is bred for its hair, which is clipped and woven into underclothes, etc. Other varieties are peculiar chiefly in color. For methods of breeding, etc., consult Knight, ‹The Book of the Rabbit› (London 1889); Rayson, ‹Rabbits› (London 1880); Carnegie, ‹Practical Game Preserving›; for history, variations, habits, etc., Darwin, ‹Animals and Plants under Domestication› (Vol. I, New York 1868); Palmer, ‹Jack Rabbits of the United States› (Washington 1896); Reports of the Royal Commission of Inquiry on the Extermination of Rabbits in Australasia, especially that of 1890.

**RABBIT FISH,** in the southern United States, a globe-fish (q.v.) of the genus *Lagocephalus*. In Bermuda and other islands of the middle Atlantic, a common market-fish, caught in deep water. It is a rather large, reddish brown escolar (*Promethichthys prometheus*), and owes its name to its prominent front teeth which resemble the incisors of a rabbit.

**RABELAIS, François,** fräṅ-sw̤ä räb-ë-lā, French author: b. Chinon, Touraine, about 1483 (according to other authorities 1490 or 1495); d. Paris, 9 April 1553. Regarding his birth, parentage and early youth nothing definite is known. It is a fact, however, established by still existing documents, that in 1519 he was a member of the Franciscan order at Fontenay-le-Comte, in Poitou, and being at first freely permitted to study, acquired Arabic, Hebrew and Greek, and read omnivorously on almost all subjects. Eventually, however, the Franciscans came to distrust the new learning. Rabelais was deprived of his books, and in disgust fled the monastery. Shortly afterward, in 1524, he obtained permission of Clement VII to enter the Benedictine order; he moved to Maillezais but before long quitted this brotherhood also, and began to traverse the country under the habit of a secular priest. His biographers have found it difficult to follow him during this period of his life, but it seems that in his wanderings he cultivated all the sciences of the day, and especially philology, with assiduity, and that in this he exhibited powers of acquisition such as few have possessed before or since. In 1530 he was enrolled as bachelor in the faculty of medicine at Montpellier, where he lectured on Galen and Hippocrates in 1531–32, although it was not till 1537 that he obtained the degree of doctor. In 1532 he went to Lyons, where he published ‹Manardi Epistolæ Medicinales›; ‹Hippocratis Aphorismi›; and ‹Testamentum Cuspidii› (1532). In the same year he also, probably, brought out the first germ of his ‹Pantagruel› (1532), of which, according to his own account, more copies were sold in two months than of the Bible in nine years. He was made physician to the Lyons Hospital, and was a member of the Société Angélique, a coterie of scholars that had gathered around the workshop of Gryphius, the printer. The first dated edition of ‹Pantagruel› came out in 1533. This first specimen of the power of Rabelais in the style that has rendered him famous has all the grotesque humor, amounting even to buffoonery, and the variety of marvelous adventures of his later works of the kind, but wants the delicate raillery, the sustained allegory and profound philosophy which most students of Rabelais find in the subsequent versions of ‹Gargantua,› and still more in the last three books of ‹Pantagruel.› The first part of ‹Pantagruel› appeared under the anagrammatic pseudonym of Alcofribas Nasier, within a year or so after the first work, and its success was such that it passed through three editions in one year. Under the same pseudonym he also published in 1533 the first of a series of almanacs, of which now only a few fragments exist, and ‹Prognostication Pantagrueline.› In 1534 he accompanied, probably as physician, Bishop, later Cardinal, Jean du Bellay, on an embassy to Rome. The result of this journey was an edition of ‹Marliani Topographia Antiquæ Romæ› (1534). Not long after he is found again at Lyons, where the ‹Gargantua,› as we now have it, first saw the light in 1535. Late in 1535 he was again at Rome with Du Bellay, and on this occasion obtained from the Pope absolution for having neglected to enter a Benedictine house and other delinquencies. It was granted in response to his ‹Supplicatio pro Apostasia› (1535). In the year following he is known to have been practising his art at Paris, but his love of wandering had not yet ceased, and his place of abode for the next eight or nine years was as unsettled as it had been during any previous part of his life. From 1539–43 he appears to have been in the service of Guillaume du Bellay, the elder brother of the cardinal, and to have resided with him in Piedmont of which he was governor. In 1546 he was probably in Paris, when the third book of his ‹Pantagruel› appeared. In this the fantastical and trivial adventures that crowd the previous books give place in a great measure to regular dissertations, in which all the great moral and social questions of the day are discussed with the gaiety and irony peculiar to Rabelais and with a freedom that roused the suspicion of the clergy, who endeavored to have it suppressed. The favor of the king secured the free publication of this book, but it was with more difficulty that a license was obtained for the fourth book from the next king (Henry II), who had succeeded Francis in 1547. A mutilated edition of this appeared surreptitiously at Lyons in 1547. The license to publish was not obtained till 1550, and it was only in 1552 that a complete and authentic edition of the book appeared. In 1549 he was again in Rome and a description of some court festivities appeared under the title ‹Sciomachie› (Lyons 1549). Rabelais was installed in the cure of Meudon, which he had had bestowed on him by his former patron, Jean du Bellay, in 1553, and it is possible, though by no means sure, that he resided there chiefly during the remainder of his life, resigning two months before his death. He left at his death the whole of the fifth book of ‹Pantagruel› in manuscript. Sixteen chapters of this appeared under the title ‹L'Isle Sonante› at Lyons in 1562. The entire fifth book was not published until 1564. The original manuscript was discovered in 1840, ending a long controversy as to its authenticity. A sixth book was intended to be added, but there is only a fragment of it indicating its subject, ‹Les Noces de Panurge.› His enemies busily pointed out impieties, and he once fled to Metz to escape danger. Rabelais was one of the first to give flexibility and finish to the yet rude and harsh language of his country. Boileau calls him *La raison en masque*, and Rousseau, *Le gentil maître François*. His house was the resort of the learned; his purse always open to the needy; and his medical skill employed in the service of his parish. His work cannot now be easily understood without a glossary and commentary. It has been widely regarded, especially in France, as a treasury of wisdom, wit and shrewd sense. See Garagantua and Pantagruel.

The first complete edition of the ‹Gargantua› and ‹Pantagruel› is that published by J. Martin at Lyons in 1567. During the next 30 years some 60 editions of one kind or another were brought out. Of later editions the most important are that of J. Le Duchat (Amsterdam 1711); the Variorum edition edited by E. Esmangart and E. Johanneau (9 vols., Paris 1823–26); a splendid edition, illustrated by Gustave Doré and edited by Burgand des Marets and E. J. Rathery (2 vols., Paris 1857–58; 2d ed., Paris 1870); a seven-volume edition by P. Jannet (Paris 1873–74); a very carefully annotated edition by C. Marty-Leveaux (6 vols., Paris 1868–1903); and a one-volume edition by L. Moland (Paris 1881). A new critical edition by A. Lefranc is in preparation. There are English translations by Urquhart and Motteux (London 1653–94); new edition, in the series ‹Tudor Translations› (3 vols., London 1900), and by W. F. Smith (2 vols., London 1893). There is also a good German translation by G. Regis (Leipzig 1832–41; new ed., Munich 1906). Selections in English will be found in Besant, W., ‹Readings in Rabelais› (Edinburgh 1883); Stokes, F. G., ‹Hours with Rabelais› (London 1905); Wright, C. H. C., ‹Selections from Rabelais's Gargantua› (New York 1904).

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**RABIES.** See Hydrophobia.

**RABINOWITZ, Solomon,** Yiddish humoristic author, known best by his pen name «Scholem Aleichem»: b. Kief, Russia, 1859; d. New York City, 13 May 1916. He began his career as a writer of short Yiddish stories in the Russian-Yiddish press. Because of the Kishineff pogroms, he came to the United States in 1906, and was received with great acclaim by his coreligionists. He returned later to Russia, where he met with pecuniary reverses, which were at once relieved by his many thousands of warm admirers. At the beginning of the European War, Mr. Rabinowitz, who was at a health resort near Berlin, was detained and finally sent to Denmark. He returned to the United States in December 1914, where he was again fêted and lavishly entertained. In the United States he wrote stories for the Yiddish dailies, many of which have been translated into English. He is best known for his sympathetic, kindly, humorous treatment of Ghetto life. His admirers in the United States have called him «the Yiddish Mark Twain.»

**RABSHAKEH,** răb-shăk'ē, an officer of the king of Assyria, mistaken in the Authorized version of the Bible for a proper name, but in fact an official title, probably that of a military commander. He is sent with Tartan and Rabsaris, also titles of high officials, to take a threatening message from Sennacherib to King Hezekiah. He delivers it in the Hebrew tongue, and when requested to use the Aramaic dialect, the language of diplomacy, so as not to alarm the people, he insolently refuses (2 Kings xviii–xix; Isaiah xxxvi–xxxvii). Consult commentaries on 1 and 2 Kings and the book of Isaiah; also Schrader, ‹Cuneiform Inscriptions and the Old Testament.›

**RACCOON,** the name, of Indian derivation, given to the typical members of the *Procyonidæ,* a family of carnivorous mammals, resembling the bears in their plantigrade feet and other characteristics, but differing from them especially in the long tail, sharp snout, slender body and moderate size. All of the five or six known genera are confined to America, though the related Asiatic genus *Ælurus* is now placed here. (See PANDA). The members of the typical genus *Procyon* possess six incisors, two canines, eight premolars and four molars in each jaw, and the group is well exemplified in the common raccoon (*Procyon lotor*) which derives its specific name of *lotor,* «a washer,» from its habit of washing its prey before eating it, or of holding the food in the fore paws and shaking it violently backward and forward in the water so as to moisten and saturate it as thoroughly as possible. The German name *Waschbär,* or «washing-bear» and the *raton* or *raton laveur* are also applied because of this curious habit. The raccoon is a heavily built animal, about three feet long, with a pointed snout, short ears and bushy tail alternately ringed with black and white. The general body color is a sooty or blackish-gray, and the fur consists of a close set of under hairs, with larger outer hairs, the latter being marked black and white. The upper part of the head and the portion across the eyes are colored dark brown. Throughout most of the United States the raccoon is abundant, and on the Pacific side reaches from Alaska to Central America. In spite of the settlement of the country and much persecution it generally holds its own, and in many sections is actually increasing in numbers. These animals, although typically carnivorous, yet seem to feed largely upon, and indeed to prefer, vegetable matters. In the natural state their food consists of all kinds of small birds and their eggs, mice, reptiles, frogs, crayfish, mussels, oysters, nuts, fruits, etc. Occasionally they catch fish or clear out a hen roost, and their frequent depredations upon fields of corn, of which they are very fond in the milk stage, has gained them the enmity of farmers. Raccoons are among the most strictly nocturnal of American mammals, and spend the day in sleep, usually in a hollow limb or tree trunk. During the winter they pass into an intermittent state of hibernation. About April, four to six young are born, which remain with the parents for a year or more, forming the small parties in which these animals are usually found. The raccoons are much hunted by means of dogs, which force the animal to take refuge in a tree, whence it is dislodged by climbing. The subtlety and cunning displayed by these animals in their endeavors to escape have become quite proverbial — expressions such as «sly 'coon,» «wake as a 'coon,» indicating these qualities. They are, however, very easily trapped, and when taken young make very gentle and interesting pets. They use their fore paws almost as expertly as a monkey its hands, and their great curiosity prompts them to investigate everything which attracts their attention. The agouara or crab-eating raccoon (*P. cancrivorus*) is found throughout South America. It is generally larger than the common species, the tail being shorter, of a grayish-yellow tint, and marked with six black rings. The fur is blackish-gray, tinted with yellow, and of variable lights and shades over the different regions of the body. The eyes are surrounded by dark-brown patches, which run into the ears, and terminate in a patch on the top of the head. Although denominated «crab-eating,» it does not appear to be specially addicted to this dietary.

Related genera are *Bassaris,* of which *B. astuta* extends from Mexico into the southwestern United States, *Nasua,* the curious arboreal coatis of Mexico and South America, and *Cercoleptes,* represented by the Central and South American kinkajou, which has a long protractile tongue. Consult Stone and Cram, ‹American Animals› (New York 1902); Audubon and Bachman, ‹Quadrupeds of North America› (New York 1851); Beddard, ‹Mammals› (London 1902); Ingersoll, Ernest, ‹Wild Neighbors› (New York 1897); Merriam, C. H., ‹Mammals of the Adirondacks› (ib. 1893); Seton, E. T., ‹Life Histories of Northern Animals› (ib. 1909); Stone and Cram, ‹American Animals› (ib. 1914).

**RACCOON-DOG,** a small wild-dog-like animal (*Nyctereutes procyonides*) of eastern China and Japan, much resembling a miniature raccoon in appearance, especially about the head. It lives in burrows, gathers most of its food (fish, crabs, etc.) along the banks of rivers, and is frequently kept in captivity, especially among the Japanese, who also value its fur and eat its flesh. Its fur is long and grizzled, but handsome; its muzzle sharp, ears short and tail short and bushy. Consult Mivart, ‹Dogs, Jackals, Wolves and Foxes› (1890).

**RACCOON-OYSTER,** a name in the Southern States for the small irregular wild oysters, growing numerously in the salt marshes, and much eaten by raccoons and other animals.

**RACE, Cape.** See CAPE RACE.

**RACEME,** rą-sēm', *in botany,* a form of inflorescence in which the primary axis is elongated, and bears flowers placed on pedicels of nearly equal length, as in the currant. A raceme differs from a spike only in having the flowers being stalked, instead of sessile. See FLOWER.

**RACER, BLACK RACER,** or **BLUE RACER,** a blacksnake (q.v.), especially the common lowland one (*Zamenis constrictor*), so called from its swiftness.

**RACES, Origins of.** Any discussion of race is handicapped by four points of obscurity: firstly, there exists no very clear idea in the mind of many as to what constitutes race; secondly, the marks of differentiation which serve to set off one race from another are often vaguely presented; thirdly, there seems to be no very reliable knowledge concerning the number and the origin of races, and, finally, geographical location is not invariably clearly defined. To produce type a certain set of elements must persist generation after generation and to trace this type is to go backwards to the very dawn of mankind's awakening and to inquire what beings existed on the globe at that time.

Geology supplies that there were roughly three great periods, called, respectively, the Mesozoic, Tertiary and Quaternary, and that these corresponded with the development of

(1) reptiles and the rise of the flowering plants, (2) mammals and the appearance of modern plant life, and (3) man, that is, the prevalence of the Stone, Bronze and Iron Ages, comprising the extinction of the great mammals and the dawn of mind, art and industry. These facts may in essence reflect the zoological division of zoöphytes, mollusca, articulata and vertebrata, the last named being divided into reptiles, fish, bird and mammals, the crowning apex of which order is man.

Whether or not man is the ape himself, there stood, nevertheless, man (or many men, say the polygenists who conceive the world to have been peopled simultaneously at various spots on the earth's surface, thereby refuting the monogenists who hold to the «Biblical» original pair), with skull, stature, skin and hair, which elements are the *foci* upon which subsequent races and nations are to be differentiated and determined. That concerning the time of the Rough Stone Age, when fauna and flora initiated their appearance, little is known of man but the formation of his skull, the only remainder that could have come down to the present over a bridge of more than 100,000 years is evidenced in the single fact of the skull being of the nature denoted by scientists of enlightened days Neanderthal, that is, Cro-Magnon, dolichocephalic or long (the relation of the length of the head to its breadth is the formula upon which craniology orientates modern racial division). Yet even this fact of long-headedness among the olden men is not didactically vouched for. Archæology in giving the rough outline of those unknown ages which, under the name of Stone, Bronze and Iron, comprised early rudiments of human life, the transition to shelters, the correlation of animal existence as, for instance, the presence of the wooly mammoth, rhinoceros, reindeer and cave bear in successive waves of existence, can, after all, only rely upon scant evidence such as produced from caves, kjökken-möddings (kitchen leavings), and pile villages.

Early life was characterized by the very rudiments of human activity. Hunting and fishing must have been followed by agriculture, and all these occupations demanded tools. This demand set man's inventive energy to work to grapple with the making of tools, fire and the bow and arrow. Decorating, weaving, the making of pottery and the domestication of animals were gradually learned. No division of labor could have occurred until after the formation of the state, however, for division is dependent upon organization and the centralization of a directive agency. The simplest and most isolated industry must have preceded the institution of trade, but that the associative element of trade must soon have begun to make itself felt is proven by the early occurrence of fairs. The making of homes presupposed some sort of marital condition necessary for the rearing of children, consequently promiscuous marriages, polygamy, polyandry and monogamy have variously characterized primitive family life. The importance of the family was indeed not to be gainsaid in early days, for to it can be traced the rudiments of state organization in such forms as the patriarchal family. In the patronymic grouping can also be detected the early beginnings of religious observances. The worship of an ancestor antedated the rise of a priestly cult. With settled life, religion, associated in the mind of a savage with nature wonder, took its first definable form. Slower to evolve but betokening a higher degree of specialization than industry or religion in primitive life is politics. The establishment of a state marks a climax in the transition of society from primitive to civilized form. It is the note of difference between tribal and civil society, where conditions of increasing wealth and population demand systematic cultivation of agriculture and organized social life. Restlessness and lawlessness have to be overcome by the force of the state; a machine of government is organized and later towns grow up, considerations of citizenship and economic relations make their appearance. Upon economic relations are based science, commerce and invention and these relations become eventual factors for differentiating kinds of states.

That a nation resembles an individual in being formed of certain elements is undoubted. Social, psycho-physical and physical traits are present in each aggregate whole. One is a unit as the other is a unit. Individuals are units marked off and differentiated from each other by racial and national barriers, possessing, however, common intellectual, emotional, moral and physical faculties, therefore, participating in culture and civilization as a whole and expressing art, religion and literature.

The physical characteristics in forming the basis for classification of all mankind in great stocks, or varieties, or races, divide men into color classifications as, for instance, Deniker's division of white, yellow, reddish brown and black-skinned strains. Furthermore, hair may be straight, slank, wavy, spiral, frizzy, curly, woolly or fleece-like. It may be long or short. The color may range from pale blond through the ruddy shades to jet black. The correlations of body height and head index added to color defines racial characteristics more narrowly. Head index of all body characteristics the least changed under the mutable conditions of environment gives the final stamp to racial distinctions in its dolichocephalic and brachycephalic classifications.

Hair, skin, eyes, stature and head index are characteristics common to all men and on these points Europe, Africa, Asia and America can be classified. Over these continents are distributed the white, yellow, red and black-skinned races — black in Africa, red in America, yellow in Asia and white in Europe. The low-statured, black-haired Esquimau may resemble the yellow-skinned Japanese in some points of classified likeness, yet that they should radically differ from the red-skinned American Indian or the black-complexioned African of New Caledonia bespeaks the existence of distinct marks which may be taken as representative of the continuity of a certain set of elements persisting generation after generation in spite of the passage of the years — which is essentially race in unit.

Sergi in classifying races principally according to cephalic index recognizes the Mediterranean district as the centre of dispersion of the European races, and consequently divides mankind into the Eurafrican and Eurasian accordingly as the races have made their home in Africa and Europe, or Asia and Europe. Subordinately Eurafrican stock is divided into two varieties, Mediterranean and Nordic. Eurafrican and Eurasian varieties are designated by Ripley Teutonic and Alpine Mediterranean. The Teutonic type is white-skinned, blond-haired, blue-eyed, narrow of head and tall of stature; the Alpine type is white-skinned, brown-haired, bluish-gray-eyed, round of head and mediumly tall; and the Mediterranean type is olive-skinned, dark-haired, dark-eyed, long of head and mediumly tall. These latter three racial strains form the centre of world activity at the present. Anglo-Saxon Teutons colonized and together with Alpines and Mediterraneans, reared and superimposed a state structure upon the red-skinned racial base of the North American continent. Mediterranean Spaniards, Portuguese and other Europeans have peopled the southern American continent. Dark-skinned Africans, chocolate-colored dwellers of the Pacific and slant-eyed inhabitants of the Celestial Empire are all pushed into obscurity by the battling pre-eminence of Teutons, Alpines and Mediterraneans.

The old law of conflict, savage tribe exerting its will on another savage tribe, is illustrated in subordination of one nation by another, of rising and falling powers, of destinies that wax and wane. In primitive form the subordination is physical, in the civilized it is ethnological, for language and customs are imposed instead of brute force.

Thus have the nations shifted, till to-day instead of unbroken areas of savage tribe, primitive hordes or the embryo state-formation of village life there are crystallized units possessing a common language, common creed and inspired by identical ideals of statehood. The fact that a people is thus massed together produces a certain unity — thus it is possible to speak of «the English» as a unit and mean a definite type. That the original Britons were dark and small of stature is generally supposed. after the dawn of history these primitive characteristics came to be identified with the traits of traders and invaders who visited the island, but who, anthropologically, were hardly important. Danes and later, Normans, were invaders, but unlike the Romans they changed the anthro-ethnological type of Britain, for they came to settle and perpetuate the race. The significance of this contact between two representative strains of the Teutonic stock should not be disregarded, for in it are perhaps to be discovered dynamic elements which were to contribute to the eventual rise to world power and physical superiority of one of the participating nations. The Normanizing of English affected language, government, church and nobility. The Norman Conquest is really the birth of England because it was the last of the invasions and paved the way for the working out of the homogeneity of a people. A state is based on homogeneity of race, compactness of territorial possession, religious cohesion and stability of government. But it is men who in the last analysis make a state, and when through the consciousness of the members of a state there runs a consciousness of kind, a feeling of like-mindedness and a sense of brotherhood, a state is evolved. Upon the utilitarian character of the Briton has been built the great structure of England's commanding position in the world arena. Commercialism, based upon domestic security and an adequate financial foundation, has resulted in a growth of invention rapid enough to settle great industrial problems and a scientific outlook keen enough to maintain a trade which brooks no rival. The statehood behind all this is a state with a policy of common sense and resolution. England, unlike un-Teutonic countries, has made no great contribution to the heart of religion, she has rather contributed to the thinking powers of religion. Criticism and good taste are English churchly attributes. These qualities likewise characterize the Briton in art and literature, that is, cosmopolitanism.

On the other hand, what is most attractive in the life of the German strain of the Teutonic branch is what is most German. It is one of the most striking peculiarities of German culture that it delights in the pedantic substitution of what is vaguely cosmopolitan for what is native and of the soil. Yet the supremely cultivated man is not the man of pedantic encylopedic knowledge, but the man who possesses the key to distinction of style, which is the finely culled result of scientific detachment and dispositional reposefulness.

Definite knowledge of Scandinavia's racial origin is lacking. The Neanderthal man of the paleolithic or diluvial period may be the foundation type of Scandinavian races as of other European strains. At any rate it is believed that two race strains, the Cro-Magnon or dolichocephalic and the Dissentis or brachycephalic types, have existed in Scandinavia for a very long time. During the Bronze and Iron ages there were men in Scandinavia who ploughed and tilled the soil. The waves of civilization which no doubt swept over Europe touched the northern countries as well and brought changes in industry and language. At the dawn of history two races were known to be existing in Scandinavia and till to-day there are two distinct strains to be observed in the population. History, however, has emphasized one type to the exclusion of the other, and the tall, fair, blue-eyed type has received the preponderance of attention.

That these fair-haired, blue-eyed Northmen were indeed quite similar to their kindred of the other Teuton districts is proved by the fact that great similarity characterized the tongues of the respective countries in the earliest of Saxon times. Not only could an Icelandic bard be understood in Norway, Denmark and Sweden but also by Frisians in England, for the root dialect of English as well as Norwegian, Danish and Swedish belongs to the Teutonic branch of the Indo-European stem, according to Prof. Max Müller. The Frisians in coming to Britain brought their Low German dialect with them. The Scandinavians, using another but related dialect, gradually built up their separate philological system, as the English eventually did theirs. Dialect precedes language, as tribes, clans and families precede the state. A language grows by stages, there is the composition of roots, the gradual discernments of meanings and the systematic elaboration of grammatical forms. In the old Eddas of Iceland and the Beowulf of Britain great resemblances of speech are to be found. Nevertheless, with the passage of time differentiation sets in and new forms are evolved. The Norman tongue, which was the Norse dialect Latinized, came to England to mix with the old Frisian Low German, and a new language eventually to be called English sprang into existence.

Thus, the ruddy, fair-haired Englishman is akin to the tall, blond Swede, and the short, dark Welshman is akin to the broad-headed Dane in the respect that in the beginning all have had a common ancestry and ethnological breeding. That one can go farther and say that from these similarities other similarities result is doubtful. True as it is that Scandinavians agree in reproducing Teutonic type identically with the English in some respects, in the Protestant form of religion, in the nature of their government and in their common qualities of love of independence, self-reliance, common sense and in their allegiance to the principles of logic, nevertheless in many other respects these two representatives of the one type do differ strikingly.

Anthropologically distinct from the Teutonic type is the Slavic, Celtic or Alpine type. Differing not only in stature and coloring but markedly in head index, this second type has, in contradistinction to the Teutonic, its own location and geographical setting. It is the Eurasian race mentioned by Sergi, or the Alpine by Ripley, and in ethnological terms it is called the Celtic race. Its habitat is, broadly speaking, northwestern Asia and central Europe. Its representatives are in the Slav nations, Russia and South Slavic states, Serbia, Rumania, Montenegro, etc., also Switzerland, France and Belgium. Anthropologically distinguished, the type is broad-headed, with eyes of blue or gray. Unlike as are the nations included in this type, nevertheless, distinguished from the other extremes, the tall, fair and long-headed Teutons and the short, dark, swarthy Mediterraneans, they are easily recognized to belong to an intermediate type.

France and Russia may serve to represent the second or Alpine race. Unlike in some anthropologic, ethnographic and sociologic respects, these nations nevertheless have certain bonds in common. In regard to the anthropologic type, there is a likeness of components rather than of wholes, for it is to certain strains in one that the other agrees. As to historic evidence of the men who lived early in Gaul and on the Russian plains, it may be said that Gaul was inhabited by what in ethnology are called Celts, broad-headed individuals who were mediumly tall; in Cæsar's first conquest of the Gauls he found such men called Belgae, Gauls and Iberians, and Tacitus wrote of the Scythians living in the Carpathian Mountains. But both of these Alpine districts were also to be intermixed with Teutonic strains, France with the Burgundians, Visigoths and Franks, and Russia with the Swedes migrating from the north and touching Novgorod on their itinerant trail to Constantinople. Consequently, to-day Teutonic elements are found in both the Russian and French nations.

But it was long before the evolution of the finished French and Russian states that these events took place, and in the East the mixture was destined to become increased to a yet greater extent before the real Russian nation was evolved. The early history of Russia is briefly told: the patriarchal family, the growth of the towns, the rise of the early states of Kiev and Moscow, the growing power of the Czars and of the princes, and the final concentration of power in one prince at Moscow, constitute the account. Early history thus politically told must also note the great anthropologic changes which have played a rôle in Muscovite history, that is, the Finnish and Tatar inroads which have been made upon Russian soil. Finns from the north came down to what is now known as Lette Lithuania. Tatars from the East, Chinese Tatary, sweeping over the immense Russian plains, brought an Asiatic influence which was to affect Russia but sociologically and ethnographically more than anthropologically.

Foreign traits thus contributing to disposition, character and type of mind distinguish the Russian people from the Teutons on one side and from their fellow Celts, the French, on the other.

The French type is convivial in character and creative in disposition. The French social traits of hospitality, desire to please, humor and extravagance show their conviviality. These character traits are governed and held in check by the creative power in the French disposition, which seeks thrift and the adaptability of means toward end. Furthermore, in the sphere of morals the possession of a distinct power, the will, distinguishes French from Russian personality. It is will power applied to the vanquishing of acceptable [illegible], however, rather than to the overturning of repelling obstacles. The rationalism of the Teuton is absent. Intellectually, thinking approaches the Latin or Mediterranean type, for it is deductive. Unlike the Saxon common sense thinking, there is a tendency to intellectualize for intellect's own sake which verges upon the dreaminess of the South.

Although all the western districts bordering the Mediterranean Sea repeat the Mediterranean type, it is to Italy particularly that we look for the greatest historical and cultural manifestations of this type. And yet Italy itself constitutes an anthropological problem. By whom was it peopled and how was it settled? Many theories are offered in explanation. Three contrasting theories of original Italian type have been advanced. The Teutonic Aryan has been said to be the foundation type, also the Scythian or Slavic origin has been suggested, but Sergi holds to an original Mediterranean type.

Physically the Mediterranean figure possessing a dolichocephalic head index, short stature and dark hair and eyes is accepted as the usual Italian individual. Italian disposition is a combination of the aggressive and instigative — aggressive as old Rome was aggressive and instigative as have been the cabals and political intrigues from the days of Lorenzo the Magnificent to the modern age. In character as well as in disposition the Italian personality is a compound of two blends, austere and convivial — austere as were the old law-making administrative magistrates, convivial as the beauty-loving Italian is convivial. As Italian disposition and character are complex so is the type of mind. The calm, appraising quality of Italian judgment is combined with the hot impulsiveness of emotion, a combination which makes the Italian a past master in the art of revenge, vengeance, cabal and intrigue. As with all Latins, so with Italians, commerce plays a subordinate rôle to art. It is in the sphere of emotion, morals and intellect that Italy has won her great sociological achievements, namely, art and the Church. More productive in the realm of art than the Celt, and more productive in the realm of religion than the Teuton, the Mediterranean personality yet falls behind the Teuton in creative expression of governmental talents.

Thus have the nations developed and specialized till to-day instead of physical entities such as wandering primitive men and woolly mammoths roaming the earth's surface, there are definitely marked national aggregates: England, a crystallized unit of people, described in type as tall, fair-haired, long of head and light of eyes, possessing an emotional life which is balanced and logical, an intellectual type of mind which is inductive and reasoning, a capacity for commerce and industry; a France that is temperamentally, artistically creative, contributing more to literature and art than to church or state; an Italy, cool and logical, contributing more to the heart than to the head of religion. Akin to the Italian Mediterraneans, the Spaniards of the American continent vie with that related strain and yet partake of the Teutonic qualities of the North American continent, recreating in the western section of the globe the commerce and industry of the European Teutons, and coming to endure along with the clearly inductive, boldly logical and successfully worldly Teutons the absence of the introspective and dreamy quality of the emotionally constituted Latins and Slavs.

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**RACHEL,** in Bible history, the second daughter of the Aramaic cattle-owner, Laban. Jacob obtained her as wife by devoting 14 years to the service of her father. At the end of the first seven years he found in his veiled bride not the Rachel promised, but Leah, her elder sister, whom he did not love, and was obliged to serve seven years more in order to gain Rachel. She was the mother of Joseph and Benjamin, the birth of the latter causing her death. Her story is told in Genesis, especially in chapter xxix. Her so-called tomb, the authenticity of which, however, is very doubtful, stands to this day on the road between Jerusalem and Bethlehem and is held in the highest veneration by both Jews and Mohammedans. Consult Archer, W., ‘Rachel of Padanaram’ (London 1843).

**RACHEL,** rā-shĕl (ELISHA RACHEL FÊLIX), French tragédienne: b. Mumpf, canton of Aargau, Switzerland, 28 Feb. 1820 or 21; d. Le Cannet, Provence, 3 Jan. 1858. Her father was an Alsatian Jew, naturalized in France, and after much wandering about Europe in his trade of peddling established his family at Lyons, where the two oldest children, Sarah and Rachel, sang and begged in the streets and in cafés to help out the family support. About 1830 they removed to Paris and the two girls sang on the boulevards until discovered by Etienne Choron, teacher in the school of Sacred Music, who undertook to teach them singing. Rachel's voice was found to be too harsh for this, and in 1834 Choron induced his friend, Saint Aulaire, to train her for the stage. On the advice of M. Samson she entered the Consevatoire, where, however, her harsh voice and small stature seemed at first against her. She made her début in a play called ‘La Vendéene’ at the Gymnase in 1837. The next year she joined the company of the Théâtre Français and made her first appearance as Camille in Corneille's ‘Horace’ 12 June 1838. She appeared in several parts successively and finally repeated in September her performance of Camille, was seen and applauded by the powerful critic of the *Debats,* Jules Janin, and her position established. After appearing in other parts in the French classic drama with increasing success, she visited England in 1841 and again in 1842, repeating her triumphs there. Later while still supreme at the Théâtre Français she made visits to other European cities, and in 1855 appeared in America. Here her success was only moderate, owing to her unfamiliarity with the language. A severe cold caught during her American tour ended in a consumption, from which she died at Le Cannet in the south of France. She was buried in the Jewish part of the Père Lachaise in Paris. Her great reputation was made in five or six rôles of the ancient classic drama of France, of these Phèdre being accounted her greatest. In the course of her career she created 13 modern rôles, written for her, ‘Adrienne Lecouvreur’ alone of these still holding a place on the modern stage. She appeared in several other modern rôles that had been acted before her representation. She excelled especially in the impersonation of evil passion. Both her voice which through careful training had been changed from its former harshness to remarkable flexibility and melodiousness, and her restrained majestic acting, resulted in a rendition of her parts which was as perfect as it was thrilling. Consult B—, Madame de, ‘Memoirs of Rachel’ (New York 1858); Beauvallet, L., ‘Rachel and the New World; a Trip to the United States and Cuba’ (New York 1856); Darcie, J., and Corbin, W., ed., ‘Mlle. Rachel's Plays’ (New York 1855); Faucigny-Lucinge, A. de, ‘Rachel et son Temps’ (Paris 1910); Fleischmann, H., ‘Rachel Intime’ (Paris 1910); Gribble, F. H., ‘Rachel; her Stage Life and her Real Life’ (London 1911); Janin, J. G., ‘Rachel et la Tragédie’ (Paris 1859); Kennard, N. H., ‘Rachel’ (Boston 1886); Mirecourt, E. de, ‘Rachel’ (Paris 1854); Poinsot, E. A., ‘Rachel, d'après sa Correspondence’ (Paris 1882); Thomson, V., ‘La Vie Sentimentale de Rachel’ (Paris 1910).

**RACHITIS.** See Rickets.

**RACHMANINOV,** räk-mä'nē-nôf, **Sergei Vasilyevitch,** Russian composer and pianist: b. government of Novgorod, April 1873. He entered the Conservatoire at Saint Petersburg at the age of nine, and in 1885 went to Moscow to study at the Conservatoire there, specializing on the pianoforte. His masters for piano were Zvierev and Siloti, pupils of Tschaikowsky, Liszt and Rubinstein; and for composition and theory he studied under Taneiev and Arensky. He was awarded the Conservatoire's gold medal for composition in 1892, and went on an extended concert tour of Russia. In 1893–1903 he was professor of piano at the Maryinsky Institute for Girls at Moscow, meantime acting as conductor at the Moscow Private Opera in 1897–99; and appearing in London in 1899 at the Philharmonic Society's concerts, where he distinguished himself as composer, conductor and pianist. He conducted the Moscow Imperial Theatre in 1904–06, and afterward devoted himself to composition and concert tours in Europe and America. His work is strongly influenced by the Moscow school, and is splendidly characteristic and rich in variety and color. He is regarded as one of the foremost living Russian composers. He is author of many songs and choruses as well of piano pieces, of which his ‘Prelude in C Sharp Minor’ is especially well known and characteristic. He has written three operas, ‘Aleko’; ‘The Niggardly Knight’; ‘Francesco da Rimini’; two symyhonies, three concertos, the ‘Elegiac Trio,’ in memory of Tschaikowsky, much chamber music and miscellaneous compositions.

**RACINE, Jean Baptiste,** zhŏṅ bätėst rä-sēn, French dramatist: b. La Ferté-Milon, Picardy, 21 Dec. 1639; d. Paris, 21 April 1699. He studied at the College of Beauvais, and subsequently at the Port-Royal Institution, where, under the care of Lancelot and Lemaistre, he became a profound Greek scholar. In 1658 he left the Port-Royal, and began the study of philosophy at the Collège d'Harcourt at Paris. To this period belong his first literary efforts, and ode called ‘Nymphes de la Seine,’ composed in honor of Louis XIV's marriage, and for which he was rewarded by Chapelain, then the dispenser of the royal bounty; and two comedies, now lost. About the same time he became intimate with La Fontaine, and this intimacy was so far from tending to make his life more regular, that those of his relations who took most interest in him, and who had destined him for the Church, began to be anxious about his prospects. In 1661 he went to live with an uncle, a canon-regular and vicar-general of the cathedral at Uzès (department of Gard), whose influence it was expected would suffice for procuring him a benefice. In this last particular they were disappointed; and at the end of about two years, during which Racine had been vainly endeavoring to study theology, he returned to Paris and the world. In 1663 he was presented at court, and soon made the acquaintance of Boileau and Molière, and began to write for the stage. His first tragedy, the ‘Thébaïde,’ was first performed by Molière's troupe at the Palais-Royal in June 1664, as was also his next, ‘Alexandre le Grand’ in 1665. His first two tragedies were merely tentative pieces, containing but few indications of the author's dramatic genius. His first master-piece was ‘Andromaque,’ which on its performance in 1667 produced a profound impression and excited well-merited admiration. It was brought out at the Hotel de Bourgogne, Racine having in the meantime quarreled with Molière. The immediate successor of ‘Andromaque’ was a comedy (Racine's only extant comedy), ‘Les Plaideurs,’ a witty and delightful imitation of the ‘Wasps’ of Aristophanes. It appeared in 1668, and was at first rather coldly received, being indeed saved only by the laughter of the king. His next pieces were ‘Britannicus’ (1669); ‘Bérénice’ (1670), composed at the request of Henrietta of England, who had also invited Corneille to write a drama on the same subject; ‘Bajazet’ (1672); ‘Mithridate’ (1673); ‘Iphigénie’ (1674), considered by Voltaire the greatest work that the French stage has produced; ‘Phèdre’ (1677), the last piece that Racine produced expressly for the theatre. Little is known of the private life of Racine during this period, almost all his correspondence having been burned from a too pious respect for his memory. In July 1673 he obtained a seat in the French Academy. In 1675 he was nominated by Colbert a royal councillor and treasurer of France for the general government of Moulins (Bourbonnais), but never entered on the duties of his office His withdrawal from the theatre in 1677 was partly due to chagrin at the success of a hostile party of theatrical critics who set up for being fine wits and applauded one Pradon, a writer now never heard of, at the expense of Racine. Soon after (1678) he was appointed, along with Boileau, historiographer to the king, whom he accompanied in his campaign in Flanders. About this time Racine became reconciled with his relations and former friends at Port-Royal. His marriage belongs to the same period. It was happy and resulted in the birth of seven children. From then on Racine played, with considerable success, the part of a courtier. After a silence of 12 years Racine, at the solicitation of Madame de Maintenon, added two other pieces to the list of his dramatic works —‹Esther› (1689) and ‹Athalie› (1691), the latter often spoken of by French critics as the most perfect of his works. They were both intended for the pupils of Saint-Cyr, the institution founded by Madame de Maintenon. The death of Racine is said to have been hastened by grief at losing the favor of the king. As a dramatist Racine is usually considered the model of the classical or national tragic drama of the French and in estimating his powers in this field it is necessary for the critic to take into account the stiff conventional restraints to which that drama is subjected. What Racine achieved within these limits is extraordinary. He added to the conventional drama as he received it a grace of which one would not have deemed it capable; he was greater as a poet than as a dramaturgist, and wrote in a style of finished perfection and distinction, developing French versification to its ultimate of rhythm and dignity. In his restraint, proportion, balance, he is rightly regarded as classic. «Perhaps it would be no exaggeration to assert,» says Dowden, «that grandeur and beauty are nowhere else so united in French dramatic art as in ‹Athalie.›» Besides his dramas Racine wrote several stinging epigrams, some odes and hymns, an abridgment of the history of Port-Royal, letters and historical fragments on the campaigns of Louis XIV. Among his letters are two in reply to a work of Nicole of the Port-Royal, entitled ‹Les Visionnaires› (1666), in which the author bitterly denounces poets and still more dramatic writers. The tone of these letters is severely sarcastic and naturally caused great offense to his old friends and masters. Only one of the letters was published at the time they were written, the other after his death. After his retirement from the theatre Racine found it easy, as has been said, to reconcile himself with his old friends. See ATHALIE; PHÈDRE.

The first collected edition containing nine tragedies then written was published in 1675–76; another containing practically all of his important works appeared in 1697. Both are in two volumes. Since then there have been almost innumerable editions of varying perfection. Among these one of the best is that published at Paris in three volumes (1801–05), regarded as a marvel of typography. An excellent edition of ‹Œuvres Complètes› was published in 10 volumes in 1865–73 in Hachette's collection of the ‹Grands Ecrivains de la France,› preceded by an admirable essay on Racine and his time by Paul Mesnard. There is an English metrical translation by R. B. Boswell (2 vols., London 1913). Most of his tragedies have also been translated into many other languages and have found many imitators, some of whom, however, succeeded in reaching Racine's perfection. Consult Beyle, M. H., ‹Racine et Shakspeare› (Paris 1854); Blaze de Bury, M. P. R. S. ‹Racine and the French Drama› (London 1845); Canfield, D. F., ‹Corneille and Racine in England› (New York 1904); Deschanel, E. A. E. M., ‹Racine› (2 vols., Paris 1891); Gavault, P., ed. ‹Conférences de l'Odéon› (Paris 1916); Larroumet, G., ‹Racine› (Paris 1898); Lemaître, J., ‹Jean Racine› (Paris 1908); Masson-Forestier, A., ‹Autour d'un Racine Ignoré› (Paris 1910); Monceaux, P., ‹Racine› (Paris 1892); Morgan, J. P., ‹Catalogue of Racine Collection› (London 1906); Racine, L., ‹Mémoires de Jean Racine› (Lausanne 1747); Roy, J. J. E., ‹Histoire de Jean Racine› (Tours 1863); Sainte-Beuve, C A., ‹Port-Royal› (7 vols., Paris 1908); Stapfer, P., ‹Racine et Victor Hugo› (Paris 1894); Trollope, H. M., ‹Corneille and Racine› (in ‹Foreign Classics for English Readers,› Edinburgh 1881).

**RACINE, Louis,** French poet and critic, second son of Jean Racine (q.v.): b. Paris, France, 6 Nov. 1692; d. there, 29 Jan. 1763. He was deeply religious and after the death of a favorite son practically retired from the world. He attained considerable attention as a poet and critic though manifestly under a disadvantage as the son of so eminent a father. His poems ‹La Grâce› (1720) and ‹La Religion› (1742) were highly praised and the latter ran through 60 editions. He also wrote a number of odes, chiefly of a religious character. His prose writings include ‹Réflexions sur la Poésie› (2 vols., 1742); Mémoires sur la Vie de J. Racine› (2 vols., 1747); ‹Remarques sur les Tragédies de Racine› (3 vols., 1752). A volume, ‹Poésies Fugitives,› published over his name in 1784, was repudiated by his widow and friends. He also published a prose translation of Milton's ‹Paradise Lost› (3 vols., Paris 1755). Of his various writings only ‹La Religion› has been translated into English (London 1754). His complete works were published in six volumes in 1808. He was made a member of the Académie des Inscriptions in 1719. Consult De la Rogue, A., ‹Vie de Louis Racine› (Paris 1852).

**RACINE,** Wis., city, county-seat of Racine County, on Lake Michigan at the mouth of Root River, and on the Chicago, Milwaukee and Saint Paul and Northwestern railroads, about 22 miles south of Milwaukee and 65 miles north of Chicago. It has steamboat connections with all the lake ports, and electric lines extend to all the nearby towns. It is 40 feet above the surface of the lake, and 690 feet above sea-level. It was settled in 1834; in 1843 was incorporated as a village, and in 1849 as a city. Racine has one of the best harbors on the lake. It is the commercial and industrial centre of a productive agricultural region about midway between Milwaukee and Kenosha. There are many creameries and an extensive lumber and coal trade is carried on. The chief manufacturing establishments are knitting mills, machine shops, flour and lumber mills, carriage factories, foundries, boot and shoe factories, tanneries, valise and trunk factories, steel spring works, hosiery mills, furniture factories, plating works and woolen mills. The products from other manufactories are bedding, men's clothing, paints, mangles, fanning mills, windmills, bicycles, bits, sheet iron, brass and copper goods, iron specialties, malted milk, chemicals, soap and other articles. The manufacturing interests are steadily increasing; it is the second city in the State in the value of its manufactures. In 1910 the capital invested in its 142 industrial establishments, employing 10,354 persons and having an annual payroll of $6,679,000, was $36,326,000, and the value of the output was $24,673,000. The prominent public buildings and institutions are the government building, the county courthouse, the municipal buildings, Saint Luke's Hospital, Saint Mary's Hospital, Taylor Orphan Asylum and the Dominican

Convent. The educational institutions are Racine College (P.E.), founded in 1852, the Racine Grammar School (P.E.), Saint Catharine's Academy (R.C.), a public high school, public and parish schools, a public library, two libraries connected with Racine College and the Y.M.C.A. library. In 1915–16 the total enrolment in its 191 public schools was 7,575 pupils who were instructed by 249 teachers. Racine, in 1918, had seven banks, three of which were national, with a total capital of $950,000 and deposits of $10,502,000. There were also two daily and three weekly newspapers, one each of the latter being English, German and Danish. In 1910, of the total population which in 10 years had increased over 30 per cent, only 112 were negroes. About 33 per cent of the white population, 12,509, were foreign born, chiefly in Denmark, Germany, Russia, Austria-Hungary and Great Britain and its colonies.

The government is administered under a revised charter of 1905, which provides for a mayor, who holds office two years, and a council. The mayor appoints the fire and police commissioners and, subject to the approval of the council, the members of the board of education. In 1914 the total receipts were $1,491,259; the expenditures for all purposes, $1,317,864; the assessed value of real estate and personal property, $49,759,719; the tax rate, $13.52 per $1,000; the funded debt, $940,000, less a sinking fund of over $10,000. The city has 12 parks, three playgrounds, some public beaches and 35 miles of paved streets. Pop. (1920) 58,593. Consult Anon, ‹History of Racine and Kenosha Counties, Wis.› (Chicago 1879); Leach, E. W., ‹Racine County Militant› (Racine 1915).

**RACING.** See HORSE-RACING.

**RACK,** an instrument of torture in frequent use in the Middle Ages, and down to a comparatively recent period. It is not known to have been used in the American colonies settled under British rule, but it is among the ancient instruments of torture preserved at Montreal as relics of French rule in that country. The rack consisted of a large, open, wooden frame, within which the person to be tortured was laid on his back on the floor, with his wrists and ankles fastened by cords to two bars at the ends of the frame. These bars were then drawn or moved by means of levers and pulleys in opposite directions till the body rose to a level with the frame. Interrogations were then put, and if the prisoner refused to answer, or if his answers were not considered satisfactory, the rollers were further moved, until at last the bones of the sufferer were forced from their sockets. The rack was also used simply for purposes of punishment, apart from desire to extort a confession. According to Coke it was introduced into England in 1447 by John Holland, Duke of Exeter, who was at that time constable of the Tower of London, hence its name "the Duke of Exeter's daughter." The question of the legality of the use of the instrument was raised when the Privy Council attempted to put John Felton, the murderer of the Duke of Buckingham, to the rack that he might be made to disclose the names of his accomplices. The judges, however, resisted, declaring the proceeding unlawful. The rack was also used in other European countries, by members of the Inquisition.

**RACKETS, or RACQUETS,** a game played in a prepared court, open or close, with a small hard ball and a kind of bat. The bat is about two feet in length, about two-thirds of which forms the shaft or handle, the remainder being an oval frame on which is tightly stretched a net-work of cat-gut. The part of the shaft by which the bat is held is covered with leather and ribbed, to enable the player to grasp it firmly. It is from this bat and the net-work, which is its principal feature, that the game derives its name (Italian, *racchetta,* for *retichetta,* an old diminutive of *rete,* Latin and Italian, a net; French, *raquette*). The close, that is, roofed court, is now generally preferred. It is an oblong rectangular space, and when of full dimensions is 80 feet long, 40 feet broad and has walls 40 feet high. The players stand facing one of the narrow walls, which is called the front wall. Two horizontal lines are drawn across the front wall, one two feet two inches, and the other, the out or service line, eight feet above the floor. The surface between the floor and the lower of these lines is covered with wood, which serves as a sounding-board to enable the players to know when it is struck by the ball.

The game may be played either single or double, that is, with either one or two persons on each side. It is decided by lot which side goes in first, and when there is only one player on each side the first player assumes which side of the court he pleases (usually the right), while the other stands in the opposite corner. The first player then begins to *serve,* in doing which he must have one foot in the service box of his side. Service consists in striking the ball with the bat so as to make it strike the front wall above the outline without previously striking any other part of the court, and then rebound into the opposite corner beyond the short line. In rebounding from the front wall it does not matter whether the ball strikes on the floor in the opposite corner of the court. If the ball is properly served the second player must strike it before it has made a second bound, so that it strikes the front wall above the board; but in returning the ball in this manner the player may if he likes first make it strike either of the side walls. The player to whom a ball is served does not require to wait till the ball has bounded from the floor before he returns it. He may return it before it touches the floor. Such a stroke is called a volley. The ball being thus returned by the second player, the first player returns the ball in the same way, and this goes on until either player fails, which may happen in three ways, either by the ball being made to hit the sounding-board, or being struck into the roof or gallery, or later than the first bound. If it is the first player who fails, his hand is out, and it is then the turn of the second player to serve. If it is the second player, then the first scores one (an ace), and the first continues to serve, but goes to the opposite side of the court. The other details of the game must be derived from the rules drawn up by the different racket clubs. Consult Miles, E., ‹Racquets, Tennis and Squash› (London 1902); *Spalding Athletic Handbooks* (New York, annually); Thompson, F. C., ‹Court Tennis, with

Notes on Rackets and Squash-Rackets' (Philadelphia 1909).

**RACOVIAN CATECHISM,** the catechism of Rakow, Poland, where it was originally printed and published in 1605. It contained a popular exposition of Socinianism. There were two such catechisms, a smaller and a larger, both afterward published in Germany by Smalcius, the former in 1605, the latter in 1608. In 1652 John Biddle translated the larger of the two into English. Parliament, on 2 April 1652, ordered all printed copies to be burned. A new English edition was brought out by T. Rees (London 1818).

**RADANTZ,** rä'donts, Rumania, city of Bukowina, 35 miles by rail southwest of Czernowitz. It has a cathedral dating from 1402, and the 15th century monasteries of Putna and Suczawica are located near the town. The Austrian government maintained a stud of about 1,500 horses here. There are manufactories of paper, leather and machinery. The population is about 70 per cent German and 25 per cent Rumanian. Pop. about 26,084.

**RADCLIFFE,** răd'klĭf, **Ann Ward,** English novelist: b. London, 9 July 1764; d. there, 7 Feb. 1823. She was married at 23 to William Radcliffe, afterward editor and proprietor of the weekly called *The English Chronicle*. Her first work was 'The Castles of Athlin and Dunbayne,' a Highland story (1789). It had little success, but perhaps as much as it deserved. 'A Sicilian Romance' (1790) is superior to it, and 'The Romance of the Forest' (1791), a still further advance, was dramatized and translated into French and Italian. Her masterpiece is considered to be 'The Mysteries of Udolpho' (4 vols., 1794), which was long very popular, and was translated into French. The last of her novels published during her life was 'The Italian, or the Confessional of the Black Penitents' (3 vols., 1797), a romance of the Inquisition, which was dramatized as 'The Italian Monk,' and translated into French by Morellet. The dramatization, very inferior to the original, was produced at the Haymarket, London, 15 Aug. 1797. A posthumous romance, 'Gaston de Blondeville,' together with some poems (4 vols.), though written in 1802, was not published until 1826. It, too, was translated into French. A small volume of verse, published first in 1816 and reissued in 1834 and 1845, contained poems inserted in her various novels, was brought out by an anonymous editor and contains also some inferior poems of the latter. Another work of hers was 'A Journey through Holland and Germany' (1795). A collected edition of her novels with an appreciative preface by Sir Walter Scott was brought out in 1824. After the publication of 'The Italian,' Mrs. Radcliffe practically retired from the world, though the frequently reiterated story that she had become insane has no foundation in fact. Mrs. Radcliffe's novels were at one time very popular. In a way she may be regarded as the founder of a new school of English novelists, but none of her followers and imitators even equalled her in imagination and ability in devising supernatural events followed by natural explanations. She had considerable power in the description of scenery, and well understood how to excite and maintain the curiosity of her readers. She was perfect mistress of the mysterious in romance and the first English writer of note to introduce descriptions of scenery into fiction. (See MYSTERIES OF UDOLPHO). Consult Beers, H. A., 'A History of English Romanticism in the 18th Century' (New York 1899); Howells, W. D., 'Heroines of Fiction' (Vol. I, p. 79, New York 1901).

**RADCLIFFE, John,** English physician: b. Wakefield, 1650; d. Carshalton, Surrey, 1 Nov. 1714. He was educated at University College, Oxford, was a Fellow of Lincoln College, 1669–77, graduated in medicine in 1675 and, at Oxford, began the practice of medicine, but removing to London in 1684 soon established a large practice which he maintained, it is said, more by his witty conversation than his medical skill. In 1686 he became physician to the Princess Anne of Denmark, and frequently attended William III after his succession. His bluntness of speech lost to him the favor of Princess Anne and later of King William, though he continued to number many of the nobility among his patients and prescribed for Pope and Swift. He was made a Fellow of the College of Physicians in 1687, acted for many years as governor of Saint Bartholomew's Hospital and in 1690 and 1713 was elected to Parliament. His learning was often depreciated; but he seems to have been an acute observer of symptoms and his immense practice gave him a wide field for observation. By his will, property was left in trust for the foundation of two medical traveling fellowships, and for the purchase of perpetual advowsons for members of University College. He also left money for the erection of various public buildings, among which was £40,000 for the public library in Oxford, since called the Radcliffe Library. From estates left in trust to the executors to administer for charitable purposes according to their judgment were built the Radcliffe Infirmary, the Osbervatory at Oxford and enlargements to Saint Bartholomew's Hospital. Later money was granted toward the buildings of the College of Physicians in London, the Oxford Lunatic Asylum and Saint John's Church, Wakefield. His prescriptions were collected and published by E. Strother, as 'Pharmacopœia Radcliffeana' (2 parts, London 1716). Consult Macmichael, W., 'The Gold-headed Cane' (New York 1915); Pittis, W., 'Dr. Radcliffe's Life and Letters' (London 1715).

**RADCLIFFE,** England, an urban district, in the county of Lancashire, seven miles northwest of Manchester, on the river Irwell and on the Lancashire and Yorkshire Railway. The ancient parish church of Saint Bartholomew dates from the time of Henry IV. There are cotton and calico works, bleach-fields, dyeing establishments, iron foundries, machine and paper factories and extensive collieries in the vicinity. Pop. 25,692.

**RADCLIFFE COLLEGE,** a college for the education of women, affiliated with Harvard University, Cambridge, Mass. Its forerunner was the Society for the Collegiate Instruction of Women, organized in 1879 to provide systematic instruction for women by professors and instructors in Harvard. This society was incorporated three years after its organization, and its educational work proved so successful that in 1894 it was formally affiliated with the university. At that time the name of the society was changed to Radcliffe College, power to grant degrees was conferred and the president and fellows of Harvard University were constituted the board of visitors of Radcliffe; which should have supervision over the administration of the affairs of the college, the granting of degrees, the appointment of instructors, etc. All diplomas given by Radcliffe are countersigned by the president of Harvard and bear the university seal. Most of the courses of study are identical with the Harvard courses, and graduate students are admitted to some of the graduate courses of the university. The courses are divided into three groups in the different branches of study: (1) courses primarily for undergraduates; (2) courses for graduates and undergraduates; (3) courses primarily for graduates. Courses in Semitic languages and history, history and theory of education, pedagogy and the history and theory ot art and music are included in the curriculum. The degrees of A.B., A.M. and Ph.D. are conferred. There are two fellowships, one for the promotion of the study of Greek history, literature, art and archæology at the American School at Athens, and one for the promotion of the study of social problems at a settlement house in Boston; there are also 54 scholarships and a number of prizes. The college has laboratories of physics, chemistry, zoology and botany, a gymnasium, dormitories, etc.; the library numbered 35,323 volumes in 1918; the Harvard University library and museums are also opened to students of Radcliffe; in 1904 a new hall fully equipped with auditorium, club rooms, etc., was built. The students in 1923 numbered 728 and the faculty 150. Le Baron Russell Briggs of Harvard University was appointed president in 1903. In 1923 income producing funds amounted to $3,000,000 and the total income was given as about $375,000. Since its organization over 1,600 students have been graduated. Consult Dowst, H. P., ‘Radcliffe College’ (Boston 1913).

**RADEGUNDA, Saint,** Frankish queen: b. Thuringia, Germany, 510; d. Poitiers, France, 13 Aug. 587. She was the daughter of the heathen Berthar, king of the Thuringians. After the victory of Clothaire, king of the Franks, over her father, she was carried off, a prisoner. She was eventually converted to Christianity and married to Clothaire (538). After her brother had been murdered by the Franks, she fled from her husband's court and, in 553, took the veil, founded the monastery of Sainte Croix at Poitiers where she resided from then on devoting her life to religious practices and charity. Her life was written by her contemporary and friend, the famous poet, scholar and bishop, Venantius Fortunatus (q.v.). Consult Baring-Gould, S., ‘Lives of the Saints’ (Vol. IX, Edinburgh 1914); Briand, E., ‘Histoire de Sainte Radegonde’ (Paris 1898); Migne, J. P., ‘Patrologiæ Cursus Completus’ (Vol. DXXII, p. 651, Paris 1849).

**RADETZKY,** rä-dĕt'skē, **Johann Joseph Wenzel Anton Fritz Karl,** Count, Austrian military officer; b. Trebnitz, Bohemia, 2 Nov. 1766; d. Milan, Italy, 5 Jan. 1858. He joined the Austrian army in 1784, served in the campaigns against the Turks in 1788–89, in Holland and Italy, 1793–96, in various parts of Europe during the later Napoleonic campaigns, became lieutenant field-marshal in 1809 and served with ability at Aspern and Wagram. After the Peace of Schönbrunn he was appointed a member of the state council of war. In the war with France he fought at Kulm and Leipzig in 1815, and in 1831 was made commander of the Austrian troops in Italy. He was created field-marshal in 1836 and in 1848–49 he crushed the revolution in Venice and Milan. He preserved Lombardy to Austria, routed the army of the Piedmontese at Custozza and Novara in 1849, concluded a treaty which assured Austrian supremacy in Italy for the time, and governed the Austrian possessions there until 1857 when he was retired after 72 years' service and after having received 46 European decorations. He trained his soldiers to a very high degree of perfection, and, though a very strict disciplinarian, succeeded in becoming the idol, not only of his troops, but of the people at large. He was kind, frank and scrupulously abstained from playing politics. A very extensive anecdotal literature, some of it in the form of fiction, has developed around his character. There are also many poems and songs about his person and deeds; a collection of songs was published as ‘Radetzky lieder’ (Aschaffenburg 1851). After his death there were published ‘Den Kschriften Militärischen Inhalts und dem Nachlass Radetzkys’ (Prague 1858); ‘Hondschriftlicher Nachlass Radetzkys’ (Stuttgart 1858); ‘Briefe des Feldwar Schallos Radetzky an seine Tochter Friederike, 1847–57’ (Vienna 1892). Consult Duncker, C. von, ‘Das Buch von Vater Radetzky’ (Vienna 1891); Gavenda, A. von, and F. de Vuko et Branco, ‘Feldmarschall Graf Radetzky’ (Prague 1858); Hackländer, F., ‘Erinnerungen on die Feldzüge der Oesterreichischen Armee in Italien, 1848–49’ (Munich 1852); id., ‘Bilder aus dem Soldaten leben im Kriege’ (Stuttgart 1887); Heller, F. von, ‘Der K. K. Oesterreichische Feldmarschall Graf Radetzky’ (Stuttgart 1858); Krones, F. von, ‘Feldmarschall Radetzky’ (Vienna 1891); Kunz, H., ‘Die Feldzüge des Feldmarschalls Radetzky in Oberitalien 1848–49’ (Berlin 1890); Sarm, H. von der, ‘Feldmarschall Graf Radetzky’ (Graz 1906); Schneidawind, F. J. A., ‘Feldmarschall Graf Josef Radetzky’ (Augsburg 1851); id., ‘Aus dem Hauptquartiere und Feld leben des Vater Radetzky’ (Stuttgart 1854); Schönhalo, C. von, ‘Erinnerungen eines Oesterreichischen Veteranen’ (Stuttgart 1852); Strack, J., ‘Die Generale der Oesterreichischen Armee’ (Vienna 1850); Trubetskoi, A. de, ‘Campagnes du Cornte Radetzky, dans le Nord de l'Italie en 1848 et 1849’ (Leipzig 1860); Willisen, W. von, ‘Der Italienische Feldzug 1848’ (in ‘Theoria des Grossen Krieges,’ Leipzig 1868).

**RADFORD, William,** American naval officer: b. Fincastle, Va., 1 March 1808; d. Washington, D. C., 8 Jan. 1890. He entered the navy in 1825, was promoted lieutenant in 1837, served in the war with Mexico and performed gallant service at Mazatlan. In 1855 he was promoted to the rank of commander and for some years served with the East India squadron. When the Civil War broke out he was assigned to the *Cumberland*, but was not aboard her when she was sunk by the *Merrimac;* although a Southerner by birth, he was a firm supporter of the Union; he was promoted captain in July 1862, and commodore in April 1863. During the assaults on Fort Fisher, in 1864–65, he commanded the *New Ironsides* and the ironclad portion of Porter's fleet, rendering distinguished services. Later, and until the fall of Richmond, he was in command of the James River division of the North Atlantic squadron. He was commissioned rear-admiral in July 1866, was in charge of the European squadron in 1869 and was afterward on duty in Washington until he was retired in March 1870. After his retirement he was on special duty with the Navy Department in Washington for two years.

**RADFORD,** Va., city in Montgomery County, on New River, 75 miles southwest of Lynchburg, on the Norfolk and Western Railroad. It dates from 1756 and is chiefly engaged in manufacturing. There are flour mills, iron foundries, brick works and other industries. Pop. 4,627.

**RADHANPUR,** răd-hạn-poor′, India (1) chief town, of a state in the Palanpur agency of the Bombay presidency, surrounded by a wall which encloses a fortified castle and the residence of the native prince. A fine sort of saltpeter is manufactured and there is some trade in cotton, wheat and grain. Pop. about 11,567. (2) A native state in the northwest corner of Gujerat covering an area of 1,150 square miles. It first came under British protection in 1813. Its native prince, who bears the title Nawab, is a member of the Babi family. The country is a level plain with few trees and no hills whatever. The majority of the inhabitants, over four-fifths, are Hindus. In 1911 the gross revenue was $87,350. Consult 'Gazetteer of the Bombay Presidency' (Vol. VB, Bombay 1914). Pop. about 65,567.

**RADIAN.** See MECHANICS.

**RADIANT STAR, Order of the.** See ORDERS (ROYAL) AND DECORATIONS.

**RADIATA,** one of the great divisions of the animal kingdom in the classification of Cuvier, characterized by having the parts of the body arranged around a vertical axis like the spokes around the hub of a wheel. Later, it was shown by Leuckart that the group was unnatural, and it has been discarded for many years. Its chief numbers are now included in the *Cœlenterata* and *Echinodermata* (q.v.). As limited by Cuvier it also embraced some of the *Protozoa,* the *Polyzoa,* some parasitic worms and a few other forms.

**RADIATION.** The term radiation is applied to a variety of cases in which energy is propagated through space like rays of light. The case most studied is that of heat. Heat rays are regarded as of the same character as light rays, the two merely differing in wave length or frequency. Writers sometimes speak even of the «color» of a heat ray to indicate its wave length or period. Conversely, every light ray is simultaneously a heat ray. According to Maxwell's theory these rays are all electromagnetic in character, consisting of states of electric and magnetic intensity perpendicular to the ray and propagated through space with the velocity of light.

Heat conduction in a medium proceeds from points of higher to points of lower temperature. If the temperature is constant, there is no conduction. Radiation is, however, independent of the temperature; for instance, the sun's rays can be concentrated by means of a lens of ice to a focus when the temperature is much higher than that of ice. Furthermore the rays passing through a point do not necessarily proceed in the same direction. They may proceed simultaneously in many different directions. Even the radiations in two opposite directions are quite independent; to specify the radiation completely, the intensity (rate at which energy flows across unit surface perpendicular to the direction of motion) must be known in all directions.

The creation of a heat ray is denoted by the word emission. Since this requires energy, only material particles can emit radiation. When we speak of the surface of a body as radiating heat, we mean merely that it allows part of the rays coming from the interior to pass through.

The radiation emitted by a substance depends on the substance and its physical condition. With the exception of phenomena of luminescence, it is generally assumed that the radiation emitted by a given body depends only on its temperature and is otherwise independent of the presence or absence of other bodies or fields of radiation.

Heat rays are destroyed by absorption. They are then converted into other forms of energy. This can be accomplished only by material particles. Rays of different frequency may be absorbed very unequally, but it is assumed that the fractional part of the rays of each frequency absorbed in penetrating a given distance through a given medium is independent of the intensity of the radiation.

A transparent, or diathermanous body is one through which the rays pass practically unchanged. If the rays pass freely but are deflected, or scattered, the body is turbid. If the surface is smooth, the rays may be regularly reflected as by a mirror. If the surface is rough, the rays may still be practically all reflected, but irregularly in all directions. The body is then white. A black body is one that absorbs all the incident radiation.

**Normal, or Black, Radiation.**— The simplest type of radiation is that which occurs in an enclosure at constant temperature. The total radiation from a given body under these conditions is called normal radiation.

Consider a number of bodies in an enclosure with perfectly reflecting walls. These bodies exchange heat until they settle to a uniform temperature. They then continue to exchange heat by radiation but each receives just as much as it gives out (Prevost's principle of exchanges). The composition of the resulting radiation is independent of the nature of the bodies present. For, if it were not so, the introduction of a new body would change the composition of the radiation in the enclosure and, since the emissive power of each body is a function of its temperature only, the resulting changes in the amount of radiation absorbed would cause changes of temperature in contradiction to the second law of thermodynamics.

For a region in temperature equilibrium, according to Kirchoff's law, a body not only receives the same total energy it gives out; but it absorbs precisely the same amount of each wave length that it emits; for the radiation received and given out are both normal radiation. If any radiation is absorbed it must be replaced by precisely the same radiation in emission. It follows, for example, that a body which does not emit a particular wave length cannot absorb radiation of that wave length and conversely.

Since a black body merely emits and does not transmit or reflect radiation, and since emission depends merely on temperature, the radiation from a black body is the same whether it is in an enclosure at constant temperature or not. Hence the radiation given out by a black body is always normal. For this reason normal radiation is often called black body radiation.

**Composition of Black Body Radiation.**— Consider the radiation in an enclosure where the absolute temperature is $T$. We have seen that the character of this radiation is a function of the temperature only. If then $u(\lambda)\, d\lambda$ is the amount of heat energy per unit volume which exists in wave trains of which the wave lengths lie between $\lambda$ and $\lambda + d\lambda$, the quantity $u(\lambda)$ will be a function of $\lambda$ and $T$ only. The determination of this function is one of the most important problems in the theory of radiation.

The first formula for $u(\lambda)$ was obtained by Jeans and Lord Rayleigh. Jeans' method was to start from the well-known result in statistical mechanics, that, in a dynamical system of a large number of degrees of freedom the energy on the average is distributed equally among the various degrees of freedom, so that each has an amount of energy $\frac{1}{2}\, RT$, where $R$ is an absolute constant. By counting the number of ways in which wave lengths between $\lambda$ and $\lambda + d\lambda$ can occur in stationary vibrations in a fixed enclosure and giving to each two degrees of freedom, corresponding to the two plans of polarization, Jeans found that

$$u(\lambda) = \frac{8\pi RT}{\lambda^4}.$$

This is known as Rayleigh's law of radiation. For large values of $\lambda$ it represents the facts fairly well. But for small values of $\lambda$ it disagrees entirely with experiment and leads to the rather questionable conclusion that the total energy per unit volume

$$\int_0^\infty u(\lambda) d\lambda$$

is infinite.

A formula that does not have these defects and that seems entirely in accord with experimental values was first obtained by Planck. His result is

$$u(\lambda) = \frac{8\pi ch}{\lambda^5\left(e^{\frac{ch}{RT}} - 1\right)},$$

where $c$ is the velocity of light, $h$ and $R$ constants.

To obtain this formula, Planck assumed that molecular systems do not emit radiant energy continuously but in chunks or «quanta.» Radiation of frequency $v$ is only emitted in multiples of $hv$, where $h$ is a universal constant. The simplest proof of the formula is a modification of that given by Jeans. Consider a system of stationary electromagnetic waves in a rectangular enclosure. The number of ways per unit volume in which such waves with frequency between $v$ and $v + dv$ can be set up is

$$\frac{8\pi v^2 dv}{c^3},$$

as in Jeans' proof. If now energy occurs only in multiples of $\varepsilon = hv$, and is distributed as is Gibb's canonical ensemble, the average energy for a wave of particular frequency is

$$\frac{\sum \varepsilon e^{-\frac{\varepsilon}{RT}}}{\sum e^{-\frac{\varepsilon}{RT}}} = \frac{o + \varepsilon e^{-\frac{\varepsilon}{RT}} + 2\,\varepsilon e^{-\frac{2\varepsilon}{RT}} + \dots}{1 + e^{-\frac{\varepsilon}{RT}} + e^{-\frac{2\varepsilon}{RT}} + \dots} = \frac{\varepsilon}{e^{\frac{\varepsilon}{RT}} - 1}.$$

Hence

$$uv\ dv = \frac{8\pi\varepsilon v^2}{c^3\left(e^{\frac{\varepsilon}{RT}} - 1\right)} = \frac{8\pi h\, v^3 dv}{c^3\left(e^{\frac{hv}{RT}} - 1\right)}.$$

By using the relations

$$v = \frac{c}{\lambda},\quad u\lambda\, d\lambda = uv\, dv,$$

this gives the formula above.

This «quantum theory» that radiant energy is emitted only in multiples of $hv$ has been the subject of very general discussion. There are some who still doubt its validity. Poincare has shown, however, that any law of radiation in which the total energy in unit volume is finite requires discontinuities similar to those involved in the hypothesis of quanta. N. Bohr has given a suggestion as to the physical significance of quanta. He assumes that atoms consist of positive nuclei with negative electrons revolving like planets around them and that there is a series of stable orbits in which each electron can revolve continuously. If disturbed it will either return to its orbit and give out no energy or it will change to another orbit and, in so doing, give off energy equal to the difference of its energies in the two orbits. In this way he calculated the spectrum of hydrogen, the calculation as given by Millikan, agreeing with measurement to less than one part in a thousand. This and other equally striking results indicate that the quantum hypothesis has a substantial basis of truth.

**Deductions from Planck's Law.**— In a constant temperature enclosure, radiant energy travels with the velocity of light, spreading out equally in all directions. The rate at which it crosses a given area in a given direction is then proportional to the density of radiation in the enclosure. If $E(\lambda)\, d\lambda$ is the portion crossing unit area in unit time carried by wave trains with wave length between $\lambda$ and $\lambda + d\lambda$, by Planck's law

$$E(\lambda) = \frac{c_1}{\lambda^5\left(e^{\frac{c2}{\lambda T}} - 1\right)},$$

where $c_1$ and $c_2$ are constants. This is also the radiation emitted by a black body at temperature $T$ whether it is in a region of constant temperature or not.

The total radiation of all wave lengths

across unit area of the surface of a black body is

$$\int E(\lambda)\,d\lambda = \int_0^\infty c_1 \frac{d\lambda'}{\lambda^5\left(e^{\frac{c_2}{\lambda T}}-1\right)},$$

Letting $\lambda T = z$, this becomes

$$\int_0^\infty E(\lambda)\,d\lambda = T^4 \int_0^\infty \frac{c_1\,d_2}{z^5\left(e^{\frac{c_2}{z}}-1\right)} = aT^4,$$

where $a$ is constant. This expresses Stefan's law that the total radiation from a black body is proportional to the fourth power of the absolute temperature.

The value $\lambda m$ for which $E\lambda$ is a maximum must satisfy the equation

$$\frac{dE}{d\lambda} = 0,$$

which reduces to

$$5\lambda T\left(e^{\frac{c_2}{\lambda T}}-1\right) = c_2.$$

Since the left side of this equation is a function of $\lambda T$,

$$\lambda m T = k,$$

where $k$ is constant. This expresses Wien's law that the wave length corresponding to maximum energy is inversely proportional to the temperature.

Both Stefan's law and Wien's law can be proved directly by thermodynamics. They, therefore, further corroborate Planck's law.

A practical application of Wien's law occurs in the problem of the luminous efficiency of a lamp. At ordinary temperatures $\lambda m$ is much larger than the wave lengths of visible radiation. Practically all the energy is radiated as heat. As the temperature increases $\lambda m$ decreases and the proportion of visible radiation thus increases. Hence the efficiency of a lamp is increased by increasing as far as practicable the temperature of the incandescent element.

**Optical Pyrometry.**— The laws of black body radiation indicate methods of determining temperature. For example, since the total radiation of a black body is proportional to the fourth power of its absolute temperature, the temperature of a radiating black body can be calculated from the observed intensity of radiation, allowance being made for the size of the body and its distance from the point of observation.

Again, if we determine by observation the value of $\lambda$ which makes $E(\lambda)$ a maximum, Wien's law

$$\lambda m T = k,$$

enables us to determine $T$. In this way the temperature of the sun has been found to be about 5500° C.

By measuring the ratio of two values of $E(\lambda)$

$$\frac{E(\lambda)_2}{E(\lambda)_1} = \frac{\lambda_1^5\left(e^{\frac{c_2}{\lambda_1 T}}-1\right)}{\lambda_2^5\left(e^{\frac{c_2}{\lambda_2 T}}-1\right)},$$

since $C_2$ is a known constant, we can calculate $T$. This is essentially the basis of the practical form of pyrometer known as the Warner pyrometer.

These optical methods are all subject to error when the radiating body is not a black body. The value of these methods is that they can be used for temperatures much higher than can be measured by other means and by using a black body at the same temperature the error can be determined. The most widely used optical pyrometer is one in which the carbon filament of a lamp is seen projected on the hot body whose temperature is to be measured. The current through the lamp is increased until the filament is no longer visible and the temperature is then inferred from the observed value of the electric current. The slight differences of color between the filament and background are eliminated by using a red glass.

**Selective Emission, Reflection and Transmission.**—A substance placed in an environment not in temperature equilibrium usually gives out a radiation that is not the normal radiation for its temperature but contains a larger percentage of certain wave lengths than normal radiation and a smaller percentage of others. Such a substance is said to exhibit selective action.

The total radiation coming from the body is partly emitted, partly reflected and partly transmitted through the body. The selective action may then be a case of selective emission, selective reflection or selective transmission. If one of these occurs, one or both the others must occur. For in temperature equilibrium the total radiation is normal, and any deficiency in emission must be made up by transmission or reflection. Now these qualities depending only on the nature of the body and its temperature persist when there is not temperature equilibrium with proper allowance of course for the fact that the incident radiation is not normal.

The following are special cases of particular interest:

(a) *Bodies Which Do Not Reflect Perceptibly.*— Such bodies do not transmit (i.e., they absorb) those wave lengths which they emit in excess. The transmitted and emitted radiations are in a sense complementary. This is the case, for example, with gases. They do not reflect perceptibly and they absorb in excess those wave lengths which they emit.

(b) *Bodies Which Are Opaque, i.e., Do Not Transmit.*— Such bodies emit radiation complementary to that which they reflect. For example, a polished metal plate is opaque and reflects nearly all the light falling on it. Therefore, it does not emit perceptibly. For this reason the walls of a thermos bottle are silvered.

(c) *Bodies Which Do Not Emit Perceptibly.*— Such bodies reflect best those wave lengths they do not transmit. Thus many bodies have what is called surface color. They appear one color by reflected light, another by transmitted light.

(d) *Opaque Bodies Which Do Not Reflect.* — These on black bodies. They emit normal radiation.

*Fluorescence.*— Many substances when illuminated by monochromatic light have the property of emitting light of a different color or frequency. This phenomenon is called fluorescence. From his investigations, Stokes concluded that the fluorescent light is invariably of lower frequency than the exciting light. This is sometimes called Stokes' law. Later observers have proved that it is not always true.

If the fluorescent emission lasts for some time after the exciting radiation has been cut off the phenomenon is called phosphorescence. There is no sharp line of demarcation between fluorescence and phosphorescence, as the duration referred to may take almost any time from zero upward. In liquids and gases this duration has always been found too small to measure. Only in solids does phosphorescence properly occur.

It is probable that phosphorescence is always accompanied by the liberation of electrons. The exciting light causes the emission of electrons from some constituent of the material and the fluorescent light arises from the recombination of these emitted electrons. The duration of luminescence is determined by the resistance to this recombination and is consequently greater in solids than in liquids or gases. This is further confirmed by the fact that fluorescence is strongly affected by changes in the physical condition of the bodies exhibiting it. Thus, some substances are only fluorescent when dissolved in non-fluorescent liquids, while others are fluorescent in the solid state but not when dissolved.

Of particular interest is the work of R. W. Wood on the fluorescence exhibited by the vapor of iodine. When stimulated by monochromatic light, the fluorescent spectrum is not continuous but consists of a series of fine lines whose frequencies are approximately equidistant with the line of the incident radiation forming one of the series. The positions of these lines change in a remarkable way when the frequency of the exciting light is altered. The absorption spectrum of iodine has seven very fine lines within the width of the green line of mercury. When the green mercury line is used for excitation it is found that a large number of the fluorescent lines are made up of fine lines having a structure similar to these seven absorption lines. This line spectrum has the further property of being converted into a band spectrum by an admixture of certain inert gases like helium.

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**RADIATION OF HEAT.** See HEAT.

**RADIATOR.** See INTERNAL COMBUSTION ENGINE.

**RADICAL, or RADICLE,** *in chemistry* (and particularly in organic chemistry), a name given to certain molecular groups whose constituent atoms possess such relations and affinities that the groups themselves persist and maintain their integrity, even when the compounds in which they occur undergo profound chemical change. The following example will illustrate the nature of a radical more clearly: Ordinary alcohol (ethyl alcohol), when free from water, has the chemical formula $C_2H_6O$. If this be saturated with hydrochloric acid gas in the presence of chloride of zinc, a compound having the formula $C_2H_5Cl$ is formed; and by treating the alcohol with iodine under proper conditions, an analogous compound having the formula $C_2H_5I$ is obtained. When this last substance is heated with water and metallic zinc, we obtain the hydrocarbon gas ethane, $C_2H_6$. These reactions, and others of a similar nature, suggest that the molecular group $C_2H_5$ persists through all of these changes; and this hypothesis is found to be justified in every way. The group $C_2H_5$ is, therefore, a «radical,» and to it the name «ethyl» has been given. The gas ethane, $C_2H_6$, is the hydride of ethyl, according to this view, and its formula may be written $C_2H_5H$. Similarly, $C_2H_5Cl$ and $C_2H_5I$ are called ethyl chloride and ethyl iodide, respectively. Ethyl alcohol, in the same way, is regarded as the hydrate of the radical ethyl, and its formula is written $C_2H_5.OH$. Ethyl is thus seen to be a monovalent radical with a high degree of stability, behaving, in its chemical relations, very much like the alkali metals, potassium and sodium. Many compounds are known in which two or more molecules of ethyl occur, with their combined valencies satisfying a single divalent atom or radical. Ordinary ether, for example, is the oxide of ethyl, its formula being $(C_2H_5)_2O$. The analogy of this substance with the oxide of potassium, $K_2O$, is complete.

If the persistence of a radical were absolute, so that we could never destroy the radical by any chemical or physical means, we obviously could not distinguish it from an element; and it is possible that some of the bodies that we now recognize as elements are merely radicals of extraordinary persistence, which we may some day succeed in breaking up into their constituents. This is pure speculation, however, and until we know more about the ultimate constitution of matter, we are to regard a «radical» merely as a convenient conception, which enables us to simplify chemical formulæ, and to form a clear general view of the analogies and chemical relations that subsist among various chemical compounds. Radicals may be classed as «acid» or «basic,» according as they have an acid or a basic character. Thus the radical $SO_4$, which occurs in sulphuric acid and in the sulphates, and which is called «sulphion,» is an acid radical, while ethyl, $C_2H_5$, is basic.

Among the simpler inorganic radicals that are of frequent occurrence, the following are monovalent: Hydroxyl (OH), the «nitro» group ($NO_2$), the «nitroso» group (NO), the «amido» group ($NH_2$) and cyanogen (CN). The following are divalent: Sulphion ($SO_4$), sulphuryl ($SO_2$), the «imido» group (NH) and the «thionyl» group (SO). In organic chemistry many radicals are recognized. The commoner basic radicals of the fatty series may be regarded as derived from the saturated hydrocarbons (or paraffins) by the removal of one or more atoms of hydrogen. Thus we have the following series, which are derived in the manner described, the radicals in each column being obtained from the paraffin at the head of that column by the removal of hydrogen atoms:

| | | | | |
|---|---|---|---|---|
| $CH_4$ | $C_2H_6$ | $C_3H_8$ | $C_4H_{10}$ | $C_5H_{12}$ |
| Methane | Ethane | Propane | Butane | Pentane |
| $CH_3$ | $C_2H_5$ | $C_3H_7$ | $C_4H_9$ | $C_5H_{11}$ |
| Methyl | Ethyl | Propyl | Butyl | Pentyl |
| $CH_2$ | $C_2H_4$ | $C_3H_6$ | $C_4H_8$ | $C_5H_{10}$ |
| Methylene | Ethylene | Propylene | Butylene | Pentylene |
| CH | $C_2H_3$ | $C_3H_5$ | $C_4H_7$ | $C_5H_9$ |
| Methenyl | Ethenyl | Propenyl | Butenyl | Pentenyl |
| C | $C_2H_2$ | $C_3H_4$ | $C_4H_6$ | $C_5H_8$ |
| (Carbon) | Ethine | Propine | Butine | Pentine |

The names here assigned to the radicals are due to Hofmann, and the system in accordance with which they are formed will be sufficiently evident, without further explanation. Hofmann's names are now commonly adopted, but some of the foregoing radicals are still known by other names also. Thus Hofmann's «ethenyl» is often called «vinyl»; and, similarly, his «propenyl,» «butenyl,» «ethine,» «propine,» and «butine» are respectively known as «glyceryl,» «crotyl,» «acetylene,» «allylene» and «crotonylene.»

The radicals tabulated above and which are of constant occurrence in organic chemistry contain only hydrogen and oxygen. Many organic radicals are known, however, which contain other elements also. The first oxygen-bearing group to be recognized as a radical was «benzoyl,» $C_6H_5CO$, which occurs in benzoic acid, and in many other compounds that are related to the oil of bitter almonds. This radical was recognized by Liebig and Wöhler, in 1832. Many such radicals are now recognized, especially in the organic acids and their derivatives. As an example, «acetyl» may be cited. This has the composition $C_2H_3O$, and acetic acid, $C_2H_3O.OH$, is its hydrate.

Many of the radicals are not capable of independent existence, and hence cannot be isolated. Others may be obtained in the free state, or in the form of a compound in which two similar radical groups are united to each other. When methyl iodide is heated with metallic zinc the iodine is taken up by the zinc, and the methyl radical, $CH_3$, is liberated. It is not obtained in the form of methyl, however, for at the moment of its liberation two of the radicals combine to form a molecule of ethane, $C_2H_6$. Ethane, therefore, may be regarded as «di-methyl,» having the formula $CH_3 — CH_3$, or as «ethyl hydride,» having the formula $C_2H_5.H$. It is convenient to regard it from one of these points of view for some purposes, and from the other for other purposes. A radical of the series tabulated herewith can exist in the free state, save for a slight change in its internal linkage, provided its valency is an even number, and the free bonds belong to adjacent carbon atoms. Ethylene, for example, has the formula $C_2H_4$. When it exists as a radical, in combination with other atoms, it is divalent, and has the structure $\begin{array}{l} —CH_2 \\ \;| \\ —CH_2 \end{array}$; the two carbon atoms being connected by one internal bond, while each carbon atom also has one bond which is satisfied by the external atoms with which the radical is combined. When the ethylene exists as a free hydrocarbon, the two free bonds shown in the foregoing rational formula satisfy each other, and the constitution of free ethylene, therefore, is $\begin{array}{l} CH_2 \\ \| \\ CH_2 \end{array}$.

The idea of a compound radical is due to Lavoisier; and the conception, although its validity was earnestly disputed for some years, has been of great importance in the development of chemistry. The definition of a radical, as given by Liebig in 1838 in his discussion of cyanogen, holds good at the present day. He said: «We call cyanogen a radical because (1) it is the invariable constituent in a series of compounds; (2) because it can be replaced in these compounds by other simple bodies; (3) because in its compounds with a simple body the latter can be replaced by equivalents of other simple bodies.» At least two of these three characteristics must be fulfilled by a group of atoms, before that group can be regarded as a «radical.» Consult Hjelt, 'General Organic Chemistry'; Meyer, 'Modern Theories of Chemistry.'

ALLAN D. RISTEEN.

**RADICAL,** the name adopted by a large section of the Liberal party in Britain, which desires to have all abuses in the government completely rooted out, and a larger portion of the democratic spirit infused into the constitution. The immediate aim of Radicals at different times has necessarily varied considerably; and though the party is now identified almost exclusively with political reform, the Radicals of the past achieved their greatest success in compelling attention to important economic changes tending to improve the condition of the laboring population. The term is applied in general usage to persons of extreme views in connection with so-called political and social reforms.

**RADIGUET, Maximilien René,** French explorer: b. Landerneau, Finisterre, 17 Feb. 1816; d. 1892. He was educated in the School of Fine Arts at Paris and in 1838 became secretary to Admiral Charles Baudin and Count de Las Casas, on a mission that had been sent to Haiti to negotiate with the government of that country for the payment of an indemnity to the descendants of the French citizens that had been murdered during the troubles of 1798–1803. His influence was of great value in bringing the negotiations to a speedy conclusion, several times preventing the impatient admiral from bombarding Cape Haytien. He was afterward secretary to Admiral Du Petit-Thouars, 1841–45, and traveled through South America and the Marquesas Islands, and afterward devoted himself to literary labors. Among other works he has published 'Album des Voyages de la Reine Blanche' (3 vols.); 'Souvenirs de l'Amérique Espagnole: Chili, Pérou, Brésil' (Paris 1856; revised ed. 1874); 'Etudes de mœurs sur l'Amérique du Nord' (Paris 1857).

**RADIO.** See TELEGRAPHY, WIRELESS; TELEPHONY, WIRELESS.

**RADIOACTIVITY.** The discovery that uranium possesses the property of spontaneously and continuously emitting penetrating rays, capable of passing through bodies opaque to ordinary light, was made by Becquerel in 1896. Since that time our knowledge of the subject of radioactivity has increased with great rapidity and a very large mass of experimental facts has now been accumulated. Only a very brief account of the remarkable properties possessed by the radioactive bodies is possible in this short article.

Shortly after the discovery of this property in uranium, Mme. Curie and Schmidt independently found that the element thorium, which is used in the manufacture of Welsbach mantles, was also radioactive and to about the same degree as uranium. The latter substance is the chief constituent of the mineral pitchblende and in an examination of the radioactive properties of this mineral, Mme. Curie was led to the conclusion that other and more radioactive substance must be present in it. By an admirable piece of chemical research Mme. and P. Curie succeeded in separating from it two new very active substances which were called radium and polonium. The substance radium was well named as, in the pure state, it gives out radiations about 4,000,000 times as intense as uranium. Polonium has not yet been chemically isolated. It differs from radium in losing its activity with time. Several years after separation the activity has diminished gradually to an insignificantly small fraction of its original value.

In addition to these bodies, Debierne and Giesel independently discovered another very active substance called actinium, while Hofmann found that lead separated from pitchblende was active and called the radioactive substance present in it "radio-lead." Somewhat later a radioactive substance called ionium was isolated from uranium minerals by Boltwood. With the exception of radium, none of these bodies have been chemically isolated.

The radiations from these substances are invisible to the eye, but possess the properties of acting on a photographic plate and discharging an electrified body. The rays from a very active substance like radium cause many phosphorescent substances to become luminous. An ordinary X-ray screen, crystalline zinc sulphide and the minerals willemite and kunzite glow brightly when exposed to radium rays. A photographic plate is rapidly affected by bringing near a few milligrams of radium bromide, and an electroscope quickly loses its charge.

The radiations from the active bodies have been shown to consist of three distinct kinds, known as $\alpha$, $\beta$, and $\gamma$ rays. Unlike ordinary light-waves, the $\alpha$ and $\beta$ rays consist of a flight of charged particles projected with enormous velocity. They differ from ordinary light inasmuch as a pencil of these rays is deflected by a magnetic and electric field. These properties of the radiations have allowed us to determine the size of the particle and its velocity of projection. Rutherford found that the $\alpha$ rays consisted of atoms of matter carrying a positive charge and moving with a velocity of about 20,000 miles a second. The $\alpha$ rays are readily stopped by matter, being absorbed by a few centimeters of air and by a sheet of ordinary note paper. The $\beta$ particles, on the other hand, are far more penetrating and pass through several millimeters of aluminum or iron. The $\beta$ particles differ from the $\alpha$ particles in carrying a negative charge and in their much greater velocity of projection. Some of them move with a velocity of over 170,000 miles per second — a speed very nearly equal to that of light. The $\beta$ particle has been found by Becquerel and Kaufmann to be identical with the cathode particle produced by a discharge in a vacuum tube. It has the smallest size of any body known to science, for its mass is only about 1/1700 of that of the atom of hydrogen. It was shown in a series of experiments conducted by Rutherford that the $\alpha$ particles consist of atoms of helium bearing a positive charge. The relative sizes and velocities of the $\alpha$ and $\beta$ particles are diagrammatically shown in Fig. 1. The relative energies of motion of the particles are also shown.

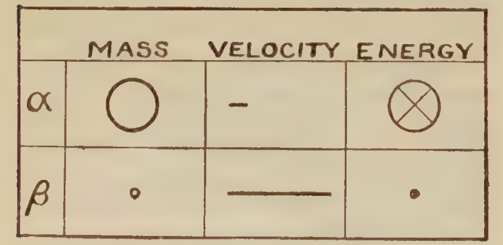

Fig. 1.

The $\gamma$ rays are of an extraordinary penetrating character, readily passing through several inches of iron or lead and several feet of water. They are not deflected by a magnetic or electric field and are a type of very penetrating X-rays. The latter consist of pulses in the ether, akin in some respects to the very short waves of ultra-violet light.

If a magnetic field is applied to a pencil of rays from radium, the rays are sorted out into the three kinds. This is shown in Fig. 2, where the magnetic field is applied at right angles to the plane of the paper. The $\alpha$ particles are bent to the left, the $\beta$ to the right, while the $\gamma$ rays proceed in a straight line without deviation. Compared with the $\beta$ rays, the amount of bending of the $\alpha$ rays is much exaggerated in the figure, for a very strong magnetic field is required to appreciably deflect the latter. The $\beta$ rays consist of particles projected with different velocities, so that some are more easily bent by a magnetic field than others. This is shown in the figure.

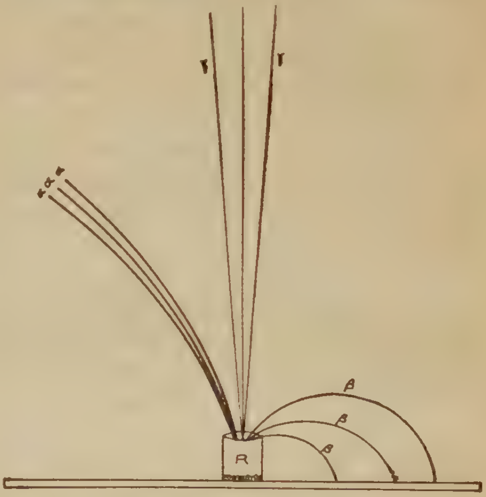

Fig. 2.

The expulsion of $\alpha$ and $\beta$ particles from the atoms of the radioactive bodies appears to result from an explosion in some of the atoms of these substances. About thirty-six thousand million of these $\alpha$ particles are expelled from one gram of radium element every second; and yet the number of atoms in a gram of radium is so enormous that this rate of expulsion can continue for several years without any sensible alteration or diminution of the quantity of radium.

The most important property of the $\alpha$, $\beta$, and $\gamma$ rays is their power of discharging an electrified body and this property has been utilized as a means of quantitative measurements of the radiations. The ordinary gold leaf electroscope, such as is shown in Fig. 3, can be used to measure radiations of extremely small intensity. A simple gold leaf is attached to a metal rod passing through an insulating cork of sulphur or ebonite. On giving a charge to this rod, the gold leaf diverges and, under ordinary conditions, the gold leaf collapses very slowly. If, however, a radioactive substance is brought near it, the charge on the system is dissipated and the gold leaf rapidly collapses.

The radiations produce a large number of positively and negatively electrified particles or ions, as they are called from the neutral gas. If the electroscope is charged positively, for example, the negative ions are drawn into it and dissipate its charge. Under suitable conditions, the rate of movement of the gold leaf is a measure of the intensity of the radiations. A modified form of gold leaf electroscope is capable of detecting the presence of an extraordinarily small quantity of radioactive matter. One millionth of a gram of radium bromide causes the gold leaf to collapse in a few seconds, and, with care, the effect of one million millionth of a gram can be accurately determined. As a means of detection of radioactive matter in small quantity, the electroscope far transcends in delicacy even the spectroscope. The ordinary quadrant electrometer is also a very convenient instrument for measuring the small ionization produced by the radiations in the air or other gas through which they pass.

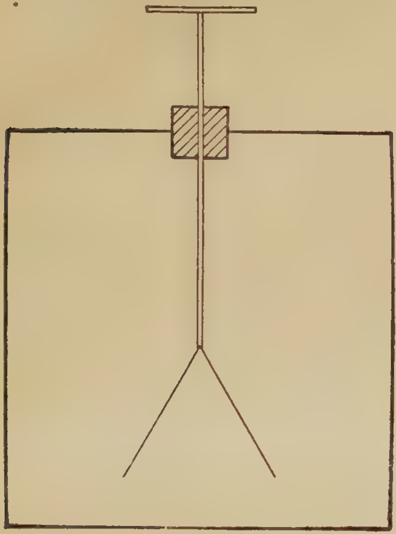

Fig. 3.

In addition to their power of giving out the three kinds of rays, radium, thorium and actinium also possess another very remarkable property. Each of these substances continuously gives off into the air a minute quantity of gas, which is itself radioactive. This «emanation,» first discovered by Rutherford in thorium, gradually diffuses from the radioactive body into the surrounding gas and can be carried away with a current of air. The «emanations,» however, only keep their power of radiating for a short time.

The activity of the emanation decreases in a geometrical progression with the time; the emanation from thorium loses half of its activity in about one minute; from radium in about four days; and from actinium in about four seconds.

These emanations have been found to possess all the properties of radioactive gases mixed in minute quantity with the air. The emanations of thorium and radium behave like heavy gases and are chemically inert like the recently discovered members of the argon-helium family. The emanations can be removed from the air by the action of extreme cold. The emanation of thorium condenses at —120° C., and that from radium at —150° C. This property of condensation of the emanation from a very active substance like radium can readily be followed by the eye. The emanation released from radium is stored with air in a small reservoir (Fig. 4). It is slowly passed through a U tube of glass, filled with fragments of the phosphorescent mineral willemite. The tube is immersed in a vessel filled with liquid air. The emanation condenses in the tube immediately below the level of the liquid air and the radiations from the condensed emanation cause the willemite to become luminous. On removal of the tube and closing the ends, the emanation, after some time, is again volatilized and distributes itself throughout the tube, causing a uniform luminosity throughout it. With a large quantity of radium emanation, such an experiment is extremely striking.

Ramsay and Soddy succeeded in isolating the emanation of radium This gas is brilliantly luminous and rapidly blackens the tube containing it. The emanation has a definite spectrum of bright lines, similar in general character to that observed for the inert gases argon or helium.

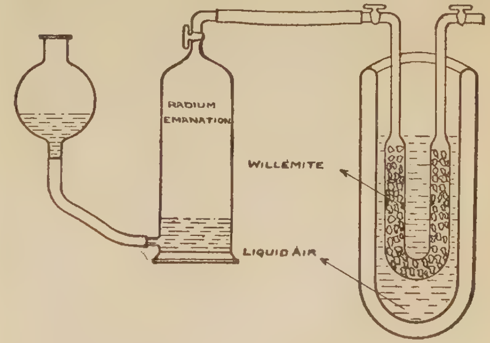

Fig. 4.

Curie and Laborde first observed the striking fact that radium kept itself continuously at a temperature several degrees higher than the surrounding air. The radium is continuously emitting heat at the rate of 132 gram calories per hour per gram of radium in equilibrium with its short-lived products; that is, it would heat its own weight of water through more than 100° C. in one hour. Rutherford and Barnes showed that the greater part of the heating effect of radium was not due directly to the radium itself, but to the emanation continuously produced from it. This emanation was separated from the radium, and condensed in a small glass tube immersed in liquid air. The heating effect of the minute quantity of emanation thus obtained was found to be three quarters of that originally possessed by the radium. Compared with its weight, the radium emanation emits a quantity of energy more than a million times greater than that released in the most violent chemical reaction. The heating effect of the emanation is not, however, permanent, but dies away with the time at the same rate as it loses its activity; that is, it falls to half value in about four days.

If a cubic centimeter of the emanation were collected in a glass tube, it would probably give off sufficient heat to melt down the walls of the tube. It can readily be deduced that one pound weight of the emanation, after its separation from radium, would emit energy at the rate of 10,000 horse power and, during the time that its activity lasts, would emit an amount of energy corresponding to 60,000 horse-power days. The heating effects of radium have been found to be directly due to the expulsion of $\alpha$ particles from its mass. Each of these particles is projected with such a great velocity that it has considerable energy of motion, which is transformed into heat when it strikes a body. These $\alpha$ particles are easily stopped by matter and, in a mass of radium, most of the $\alpha$ particles projected throughout its volume are not able to escape, but are stopped by the radium itself. Radium is thus heated by the unceasing and vigorous self-bombardment by the $\alpha$ particles shot out from its own mass. The heating effect of the emanation in a similar way, is due to the energy of motion possessed by the $\alpha$ particles expelled from it.

The emanations all show another very striking property. If the emanation is drawn through a tube, the surface of the tube becomes coated with an invisible active deposit. This deposit can be dissolved in acids, and after evaporation of the solvent, remains behind on the dish. After removal of the emanation, the deposit gradually loses its activity but at a different rate from the emanation itself. This «excited» or «induced» activity, as it is termed, is due to radioactive matter which arises from the decomposition of the emanation. The excited activity of thorium falls to half value in 11 hours, that of radium in about 30 minutes, and that of actinium in 36 minutes.

Considerable light was thrown on radioactive phenomena by some experiments of Rutherford and Soddy that will now be considered. It was found that an intensely active substance called thorium X could be separated by a single chemical process from thorium. If some thorium nitrate is dissolved in water and ammonia added, the thorium is precipitated. If the ammonia solution is then evaporated and ignited, a very active residue is obtained, several thousand times more active, weight for weight, than thorium itself. The thorium itself is at the same time deprived of more than half of its original activity. A very interesting result is then observed. The activity of this residue thorium X is found not to be permanent but to decay according to a geometrical progression with the time, falling to half value in four days. At the end of a month, the activity is less than 1 per cent of the initial value. At the same time, the precipitated thorium regains its lost activity, such that the sum of the activity of the thorium and thorium X together is always the same, and equal to that of the original thorium before chemical treatment. At the end of a month's interval, the thorium has nearly recovered its old value, and a new quantity of thorium X can then be obtained by the same chemical operation. This process can be continued indefinitely provided sufficient interval is allowed to elapse between each precipitation for the thorium to regain its activity. These results are very simply and fully explained on the following hypothesis. A small fraction of the thorium atoms every second becomes unstable and breaks up with explosive violence, an $\alpha$ particle being projected during the process. After the expulsion of an $\alpha$ particle, the residue of the thorium atom is lighter than before and becomes the atom of the new substance, thorium X. This substance is again unstable and breaks up with the expulsion of $\alpha$ particles, half of the matter breaking up in four days. In ordinary thorium, there are thus two opposing processes at work. The substance thorium X is produced at a constant rate by the disintegration of some of the thorium atoms, and at the same time this thorium X breaks up and changes into another substance. A steady state will obviously be reached when the number of atoms of thorium X, which are produced per second, is equal to the number of atoms of thorium X which break up per second. The constant radioactivity of thorium may thus be likened to the constant population of a country, where the number of births is equal to the number of deaths.

It has been found experimentally that the property possessed by thorium of giving off an emanation belongs not directly to the thorium but to its product, thorium X. The amount of the emanation is always proportional to the amount of thorium X present, and thorium freed from thorium X does not emit any emanation. This shows that thorium X is the parent of the emanation. According to the disintegration theory, advanced by Rutherford and Soddy, the atom of the emanation arises as a result of the expulsion of a particle from the atom of thorium X. In a similar way it has been shown that the emanation is transformed into the active deposit which has been found to consist of a number of distinct substances, four in all, which are successive products formed from the thorium emanation. These constituents can be separated from one another by electrolysis, or by utilizing the differences in their volatility when subjected to heat.

The process of analysis which has been applied to thorium has been applied with equal success to uranium, radium and actinium. Sir William Crookes found that uranium has a product called uranium X, which is half transformed in 22 days and gives out only $\beta$ and $\gamma$ rays. The product actinium X was discovered by Godlewski. The production of a series of disintegration products amounting to seven in all has been observed in the case of actinium. It is impossible in this short article to discuss in detail the experiments by which the presence and properties of these series of products, resulting from the transformation of the radio-elements, have been determined.

It will be seen that seven distinct transformation products have been found in radium. The active deposit of rapid change arising from the emanation consists of three substances, called radium A, B and C, which are half transformed in 3, 27 and 19 minutes, respectively. After these products have undergone transformation, a residue of very slight activity remains. The properties of this residue were examined by Rutherford, who showed that it breaks up through three successive stages, called radium

D, E and F. The substance radium D gives out soft beta rays, and is transformed very slowly — about half value in 16 years. The examination of this residue brought to light the very important fact that polonium is a product of the disintegration of radium. The product radium F is identical with polonium, for their chemical and physical properties are the same, and both lose their activity at the same rate. It has also been shown that radium D is the primary substance, which causes the activity observed in the radio-lead of Hofmann. The active substances present in polonium, and radio-lead are thus proved to be members of the radium family.

The products obtained from the radio-elements all possess some distinctive physical and chemical properties, which distinguish them not only from other products but also from the parent element. For example, radium — a solid substance with chemical properties closely allied to barium — is transformed into a gaseous substance, the radium emanation. The emanation in turn is transformed into a solid. Each of these products must be considered a distinct chemical substance. They differ from the ordinary chemical elements in the fact that they are unstable and undergo transformation into other or new kinds of matter. On account of their very limited life, these products exist in very minute quantity, and it is only in the case of a comparatively slowly changing product like the radium emanation that a sufficient amount can be obtained to measure. There is no doubt, however, that both radium D and F will ultimately be obtained in sufficient quantity to obtain their spectrum and chemical constants.

In the radio-elements, we are witnessing the transformation of matter through a series of successive stages. The products represent the halting places where the matter is able to exist a short time before it breaks down into new forms. This process of transformation is spontaneous and, as far as observation has at present gone, cannot be hastened or retarded by any physical or chemical agencies.

Since the radio-elements are steadily being transformed, the original matter must slowly disappear and be changed into other kinds. It can be calculated with some confidence that radium will be half transformed in about 1,690 years. A feebly active substance like uranium will take several thousand million years to be half transformed. The radio-elements apparently only differ from their products in their length of life; that is, in the stability of the atoms composing them.

A mass of radium left by itself would, in the course of 20,000 years, be almost completely transformed. Since the age of the minerals in which radium is found is known to be much older than this, it is necessary to suppose that radium is constantly produced from some other substance. The ultimate parent of radium is the heavy element uranium, with which it is always found associated. Such a view was strongly confirmed by investigations of Boltwood, Strutt and McCoy. Boltwood found that the amount of radium in different radioactive minerals, obtained from different parts of the world, is always proportional to their content of uranium. Such a relation indicates that radium is derived from uranium. If this is the case, a quantity of uranium, initially freed from radium, should in the course of time produce some radium. Such a growth of radium from uranium has actually been recorded in some experiments by Soddy and Whetham. The rate of production observed is, however, much slower than is to be expected if uranium passes directly into radium. It has been shown by Boltwood that an intermediate substance, ionium, is first produced and that this in turn changes into radium. The evidence is thus very strong that one element uranium produces another element ionium, which then produces radium. Each of these radioactive products is quite distinct in physical and chemical properties from its parent.

The radioactive minerals must be considered as nature's laboratory in which all the products of transformation of the radioactive substances will be found. Rutherford and Soddy early suggested that the rare gas helium, which is always found associated with the radioactive minerals was a transformation product of the radio-elements. This prediction was verified by some very striking experiments made by Ramsay and Soddy. They removed the emanation from a quantity of radium and collected it in a tube. A discharge was passed through this tube and the light examined by a spectroscope. After standing several hours the spectrum of helium was observed, showing that this gas had been produced during the transformation of the emanation. Here again we have an example of the production of one element helium from another.

It has also been observed that an element having chemical properties identical with those of lead is found in uranium minerals. This element is known as uranio-lead and is supposed to be the final disintegration product of the uranium. Its atomic weight has been found to be approximately 206 and in this respect it differs from ordinary lead which has an atomic weight of over 207.

The helium found in radioactive minerals is thus a decomposition product of radium and also of the other radioactive substances present in it. It seems likely that we shall be able to form a rough estimate of the age of the radioactive minerals by measuring the amount of helium and lead found in them, since for a given amount of radioactive matter present, the amount of helium and lead will be greater the longer the mineral has been formed.

Although radium is found in the highest proportion in the mineral pitchblende and in all other uranium minerals, it is also found distributed in minute quantity over the whole surface of the earth. This has been clearly brought out by the long series of investigations made by Elster and Geitsel of the radioactivity of different soils and of the atmosphere. J. J. Thomson, Himstedt, Strutt and many others have found that the radium emanation is present in springs and in well water. Bumstead and Wheeler found that the air and surface waters of New Haven, Conn., was impregnated with the radium emanation. Strutt and Allan have observed that the famous Bath springs contain a considerable amount of radium emanation, and the former has also shown that the water contains a minute amount of radium in solution. A similar result has been noted for the waters at Baden and elsewhere. It has been suggested that the curative properties of these hot-water springs may possibly be due to the presence of radium or the radium emanation. This has, however, by no means been established.

The atmosphere is found to always contain a small quantity of the radium emanation. This does not come from the atmosphere itself but diffuses up from the soil or is carried up by spring water. A large amount of investigation has been carried out to determine the amount of emanation present in the atmosphere at different localities and under varying atmospheric conditions.

It has been suggested that the internal heat of the earth may be, in part at least, kept up by the heat liberated by the radium and other radioactive matter present in it. Observations, that have so far been made, seem to show that the amount of radium in the surface crust of the earth is sufficient to supply as much heat to the earth as is lost by conduction to the surface from the hot interior of the earth. It is only necessary that radium should exist in the earth to the extent of four parts in one hundred million million to account for the maintenance of the internal heat of the earth. The amount of radium or equivalent amount of other radioactive matter present in the earth cannot be greater than 270,000,000 tons or otherwise the earth would be growing hotter.

It is not possible to discuss here the physiological actions that are produced by radium rays. A large number of experiments have already been made and the literature of this branch of the subject is already extensive and is very rapidly growing. For bibliography see Radium.

Ernest Rutherford,
*Revised by* Bertram B. Boltwood, *Professor of Radio-Chemistry, Yale University.*

**RADIOLARIA,** a group of minute one-celled organisms which secrete shells of silica. These shells accumulate in great abundance, and where they make up 20 per cent or more of the bottom sediments are called radiolarian ooze. This material covers large areas in the Pacific and Indian oceans.

**RADIOLARIAN OOZE.** See Radiolaria.

**RADIOMETER,** an instrument used to measure mechanical effect of radiant energy. It consists of four crossed arms of very fine glass, having at their extreme ends thin vanes of mica, blackened on one side, the blackened sides all facing the same way around the axis. The instrument is suspended by a quartz fibre in a glass vessel exhausted of air. When the vanes are exposed to rays of light or heat the wheel moves more or less rapidly in proportion to the strength or weakness of the rays. The phenomena of this radiometer (known as Nichols' radiometer, after its inventor) as determined by Maxwell, were shown to depend on the absorption of heat by the blackened sides of the vanes. This heat being transmitted to the particles of rarefied gas remaining in the exhausted globe caused them to thrust against that side of the vane and so cause a revolution. The instrument has certain advantages, but is very slow as compared with the bolometer, radio-micrometer and thermopile, requiring from 12 to 45 seconds for a maximum swing. It is, however, dependably accurate, on a single reading.

**RADIOPHONE,** an instrument that transmits or produces sound by means of radiant energy, particularly a device similar to the photophone, whose receiver is a block of vulcanite, with no telephone, the vibratory contraction and expansion being produced by the heat of the beam while vibrating, which is accompanied by an audible sound.

**RADISCHEV, Alexander Nikolaievich,** Russian author: b. Moscow, 20 Aug. 1749; d. Saint Petersburg, 11 Sept. 1802. He was descended from a noble Russian family, and after spending several years at court as a page, was sent to be educated at the University of Leipzig. He returned to Russia in 1771, and obtained a position in the department of customs. He had been deeply impressed during his absence by the writings of the French philosophers of the time, and in 1790, under the influence of his liberal sentiments, he wrote his famous 'Journey from Saint Petersburg to Moscow,' patterned somewhat after Sterne's 'Sentimental Journey.' This work is a most striking picture of Russian serfdom as it existed at the time, and contains a plan of emancipation, all the more bold for its appearance in a period of reaction. The book was immediately confiscated and the author was exiled to Ilimsk, in the government of Irkutsk, by the Empress Catharine, but was allowed to return to Russia in 1796. He was made a member of the legislative commission in 1801 by Alexander I. Soon after his appointment he was seized by melancholic attacks during one of which he committed suicide. His writings were collected in six volumes (Moscow 1807–11), but permission to reprint the 'Journey' could not be got even then. Consult Anon., 'A. N. Radischt Schew' (in *Archiv für Wissen Schaftliche Kunde von Rusoland,* Vol. XIX, p. 77, Berlin 1860); Baring, M., 'An Outline of Russian Literature' (New York 1914); Waliszewiski, K., 'A History of Russian Literature' (New York 1900).

**RADISH,** several species of herbs of the family *Brassicaceæ.* The common garden radish (*Raphanus sativus*) is thought to be a native of Asia, but is not known in a wild state. It is cultivated for its edible roots, which in various varieties may be red, white, gray, brown or black, and vary in form from turnip-shaped to parsnip-shaped. They reach edible maturity in from three weeks or less when forced. Radishes thrive best in rich, light, well-drained sandy loam. Out of doors the seed may be sown as soon as the soil can be worked, since the plants are very hardy. The seeds may be dropped about an inch apart, covered an inch deep, in rows a foot asunder in beds by themselves, or, as in market garden practice, may be sown between slower-growing crops, such as carrots, cabbage or peas. Sometimes they are even sown with the seed of parsnips, onions and other crops that are either slow to germinate or that are very inconspicuous when they first appear. They then serve to indicate the positions of the rows, so that cultivation of the other plants may begin much earlier; they must then be removed promptly to prevent injuring the main crop. For succession, the seed should be planted at intervals of a week or 10 days. Winter radishes are sown from midsummer to early autumn, and when cold weather arrives are stored in pits or cellars like other roots. Clean cultivation is essential. A Japanese species (*R. caudatus*) is popularly cultivated in Asia for its long pods which are eaten raw or pickled. It is known as the serpent or rat-tailed radish. The pods are often a foot long. The roots are small, hard and inedible. The sea radish (*R. maritimus*) is more pungent than the garden species and is little known in American gardens. Horseradish (q.v.) belongs to a different genus, *Armoracia*. Many of the insects which feed upon cabbage, turnip, mustard and related plants also feed upon the radish. The best known is the radish maggot which is the larva of a brown fly (*Phorbia brassicæ*). The maggots tunnel in the fleshy part of the root and injure it for human food. Applications of fertilizers, especially quickly soluble ones, and rotation of crops have been recommended as preventives. Consult Bailey, 'Standard Cyclopedia of Horticulture.'

**RADIUM** (Lat. *radius*, ray), was discovered in 1898 at Paris by Prof. Pierre Curie and Madame Sklodowska Curie in collaboration with Monsieur Bemont. It is the most important of over 30 newly discovered radioactive elements, and was found in the sulphate residues from pitchblende of the Austrian mines at Saint Joachinsthal, Bohemia, which had previously been worked for the metal uranium. Radium is a chemical element, symbol Ra, atomic weight 226.0, atomic number 88, very similar to barium in its chemical properties. Radium accompanies barium in many chemical reactions and is separated from it by repeated fractional crystallization of the salts, usually the chloride or bromide, the radium being enriched in the crystal fraction. A sufficient number of repetitions of the crystallization results in a pure radium salt, from which the atomic weight of radium and its spectral lines have been determined. The salts of radium most commonly prepared are the chloride and bromide (both readily soluble in water), the carbonate (soluble in acids) and the sulphate (insoluble — 100 times less soluble than barium sulphate). The salts are white when freshly prepared, have the same crystalline form as the corresponding barium salts, but on standing rapidly change to yellow or brownish tints owing to the effect of their own radiations. The glass or silica tubes in which radium salts are usually retained also become colored by the radiations. The color is usually a bluish or deep violet, but some varieties of glass are colored brown. The color may be removed by raising the glass in temperature to a dull red glow. A most striking property of radium is its continual emission of radiations and heat. The heat emission from one gram of radium element amounts to 132 small gram calories per hour. It was by means of its radiations that radium was originally discovered and by means of them that it can be detected in extreme dilution. For example, in the ordinary commercial ores containing radium its content is about one part in 150,000,000 by weight. None of the ordinary elements could be detected at this dilution and their concentration or recovery in a state of purity would be impossible. Radioactive elements emit three kinds of rays named for the first three letters of the Greek alphabet — alpha, beta and gamma. The first two, being really corpuscular in nature, are more properly termed alpha and beta particles. Alpha particles have been proved to be helium atoms with a double positive charge of electricity, and are emitted at very high velocities, one-fifteenth to one-twentieth of the velocity of light. Beta particles are electrons (single negative charge of electricity), and are emitted at various velocities from almost zero to that of light as a maximum. Gamma rays are ether vibrations (like ordinary light) but are of very short wave length and correspondingly high penetrating power. Those of the shortest wave length are 10 times more penetrating than the most powerful X-rays. The continuous emission of heat and radiant energy by radium at first greatly perplexed all scientists, as it appeared to controvert the law of the conservation of energy. The true explanation was proposed in 1903 by Rutherford (Sir Ernest E.) and Soddy (Prof. Frederick) on the hypothesis of atomic disintegration or spontaneous transmutation of one element into another, accompanied by the emission of radiation. This theory has subsequently been tested from all possible angles and has not only received the strongest experimental confirmation, but has initiated a new area of progress in the study of the constitution matter; and has incidentally placed the atomic theory on a solid basis of fact.

According to the theory of radioactive disintegration of the atoms, radium is only one member of the family of linear descendants from the parent element uranium (atomic weight 238). Each atomic change in the series is accompanied by the emission of a beta or an alpha particle, giving rise to an atom of the next lower member in the series, a new chemical element wholly different in properties from the parent. These changes proceed with the utmost regularity according to a very definite law, namely, that the same fraction of change always takes place in the same interval of time (logarithmic equation). The interval in which 50 per cent of the element changes is called its half period, a very fundamental physical constant, since the rate of change is independent of all physical or chemical conditions, such as temperature, pressure and concentration. The phenomenon is strictly a property of the atom. Therefore, all radium salts have the same radiations as the radium metal itself. The metal was once prepared in a pure state by Mme. Curie and was found to have all the properties to be expected of a base metal like barium. On account of the ease with which it oxidizes in air, it must be maintained in an atmosphere of hydrogen. The table on following page shows all the members of the uranium-radium family in their order of succession, their radiations, half periods and atomic weight.

Only a few of the interesting deductions possible from this table can be pointed out. On account of the genetic relationship between radium and uranium, the former will be found in nature only when associated with the latter, and always in the same ratio, namely, that of the two life periods to each other, or about one part of radium to three million parts of uranium by weight. This fact has been verified by examination of different uranium minerals from various parts of the world.

Whenever an atom emits an alpha particle it loses an atom of helium and hence its atomic weight is diminished by four units and its chemical valency by two units. The emission of a beta particle causes no change in atomic weight (since the mass of the beta particle is only one-seventeen hundredth of the atom of hydrogen), but the valency increases by one unit. These changes in atomic weight can be traced out in the accompanying table. That the atomic weight actually changes according to the theory has been verified experimentally for the atomic weights of uranium, radium and radium G (radiolead).

TABLE

| MEMBER | Symbol | Half period | Rays | Atomic weight |
|---|---|---|---|---|
| Uranium$_1$ | U | 5 billion years | α | 238 |
| Uranium $X_1$ | U $X_1$ | 24.6 days | | 234 |
| Uranium $X_2$ | U $X_2$ | 1.15 minutes | β | 234 |
| Uranium$_2$ | U$_2$ | 2 million years | β | 234 |
| Ionium | Io | 100 thousand years | α | 230 |
| Radium | Ra | 1600 years | α | 226 |
| Radium Emanation | Ra Em | 3.85 days | α | 222 |
| Radium A | Ra A | 3.0 minutes | α | 218 |
| Radium B | Ra B | 26.8 minutes | β | 214 |
| Radium C | Ra C | 19.5 minutes | α | 214 |
| Radium D | Ra D | 16.5 years | β | 210 |
| Radium E | Ra E | 5.0 days | β | 210 |
| Radium F (Polonium) | Ra F | 136.0 days | α | 210 |
| Radium G (Radio Lead) | Ra G | ............. | rayless | 206 |

**Radium Emanation.**— The first disintegration product of radium is the only gaseous member of this series. It is given off from all solutions or fusions containing radium, and more or less freely from radium salts and ores. It has been estimated that the total quantity of radium emanation in the atmosphere corresponds to $10^7$ grams of radium. Radium emanation was named niton (shining) by Sir William Ramsay, signifying its property of emitting light; and also by the termination *on* that it belongs to the series of noble gases such as argon, krypton and xenon. Radium emanation is used in measuring small quantities of radium, also for therapeutic purposes frequently where the element itself was formerly used. On account of its very short life compared with the parent radium it must be collected at frequent intervals from the parent solution of radium salt to compensate its rapid rate of decay. Since the gas has all the properties of an ordinary gas it diffuses, when not confined to the surroundings and deposits its solid disintegration products, radium A, B, C, etc., on any object, thus imparting apparently radioactive properties termed «induced activity» but now more correctly referred to as *active deposit*. The first three members below emanation in the series, radium A, B and C, accumulate in a confined volume to maximum quantity in about four hours.

The practical uses of radium are confined to two classes: (1) therapeutic and (2) for the production of luminous products by mixing with phosphorescent zinc sulphide. The therapeutic use of radium was suggested by the physiological effects of its rays which are very marked. Prolonged exposure to large quantities of radium produces painful and even fatal burns. By controlling the quantity of radium, the time of exposure and the thickness of metallic screening, radium may be used for the treatment of malignant growths, such as cancer, through the effect of its radiations. Some remarkable results have been achieved in this direction but much experimentation is required to determine all the physical factors involved in obtaining the best results. Radium therapeutics may still be regarded as in the experimental stage, and is much hampered by the scarcity and high cost of radium.

By mixing a small proportion of radium with an especially prepared phosphorescent zinc sulphide, a fairly permanent luminescent material is produced which can be applied to the dials of instruments or to any other surface which it is desired to render self-luminous in the dark. During the European War such material was extensively employed on airplanes, battleships and in the trenches since it had the advantage of illuminating dials, gun sights, etc., without exposing a light to the enemy, since the luminosity, even that from the strongest preparations, can be seen at a distance of only a few yards. The proportion of radium employed in preparing the luminous materials depends on the luminosity desired. About one part of radium element per 4,000 parts of zinc sulphide is the upper limit for radium. Much lower mixtures than this can be used for many purposes. The luminosity of radium paint increases for about three weeks after preparation and then falls off for some months, finally reaching a value about 20 per cent of the original brightness which appears to remain constant for several years at least.

The natural sources of radium are principally the three uranium ores — carnotite, uraninite (pitchblende) and autunite. Carnotite (a vanadate of uranium) is found extensively in the arid regions of southwestern Colorado and southeastern Utah and now constitutes by far the most important source of radium. It is estimated that more than 55 grams (or about two ounces) of radium element have been produced from this source. The principal source of pitchblende has been the Austrian mines of Saint Joachimstahl. Some radium has also been prepared in France from autunite (a phosphate of uranium), found in France near Autun and also in Spain. See RADIOACTIVITY; POLONIUM; URANINITE; URANIUM, etc.

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(Paris), *Sitzungsberichte* (Vienna Academy), *American Journal of Science* (New Haven), *Journal* of the American Chemical Society (New York), *Journal* of the Chemical Society of London, *Berichte d. deutsch chem. Gess.* (Berlin).

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**RADIUM THERAPY.** Twenty years after Madame Curie announced the discovery of radium, and 15 years of experience with its use in treatment of diseased conditions, is long enough to give some idea of its usefulness and its limitations. Radium came into use as a surgical agent some five years after the discovery and similar application of the X-ray. The latter had already demonstrated its efficiency in curing some, and ameliorating other types of malignant disease, and it was at once surmised that radium might have similar effective force, inasmuch as its output of peculiar energy was not unlike that from X-ray tubes. Exaggerated hopes and claims for both have been modified with time, and one can now estimate somewhat the worth of both. The limits of its usefulness have not yet been reached,— not only in the field of malignant disease but in other types of non-malignant tumors and skin diseases.

Everyone who aspires to the use of radium efficiently must have some fundamental knowledge of its effect on the vital growth of living, healthy cells. Without such intelligent understanding, one is not prepared to ask what happens in treating diseased cells. A series of simple experiments with garden seeds or bulbs will demonstrate convincingly the retarding effect on cell growth after exposure to radium. For example, if strong radium be placed an inch distant from any seed chosen, before planting, for from two to eight hours, these, after planting, will grow in size and vigor exactly in proportion to the time of exposure,— the longest treated may be killed, the shortest may be scarcely retarded, the middle series will grow half the normal height.

This gives the clue to the results seen in tumors. It is admitted that cell growth, whether vegetable or animal, is actuated by the same vital force. Tumors are merely the massive and exaggerated growth of cells, which are found normally at the site of the tumor. The popular expectation that large tumors can be easily removed by radium is not borne out by facts; but early treatment of small growths of typically malignant cells is successful in every-day practice, because, at that stage, there has been no wide dissemination of the disease. When the magnitude of the growth is too large for radium then surgery can remove it by knife or caustic, which only serves to emphasize the wonder of radium work, which can so alter wrong growing cells as to restore them to healthy action when small, without removing them as caustics, cautery and the knife do.

There are types of low-grade, malignant tumors which uniformly cure themselves after proper doses of radium therapy, and there are also other grave forms which yield to radium. Starting from and among the marrow cells of the bones, proceeding by absorption and destruction of the bone, if not arrested, the so-called myeloid tumors, wonderful to relate, disappear under radium treatment and new bone re-forms in shape like the one that disappeared. In one patient under the writer's care a part of the bone of the lower jaw was entirely replaced by a tumor the size of a small hen's egg. When the radium had altered the cells they melted away, the bone was perfectly restored and has remained sound and well for 15 years. Again, tumors of lymph glands are well controlled by radium and often cured unless they be tubercular. The disease of all the lymph gland system, known as Hodgkins' disease, is well treated by radium as it is also by the X-ray.

It is among the wonders of modern surgery to witness the disappearance of tumors which have overgrown parts of the body, like the eye-lid or lip, and to watch the complete restoration of the original part. So completely does this illustrate the unique and subtle power of radium, that one example may be cited: A tumor had grown on the lower eye-lid so as to destroy all semblance of more than half of it. A fortunate use of the exact amount of radium necessary caused the complete disappearance of the tumor and perfect restoration of the eye-lid within eight weeks. For 10 years afterward it was impossible to say on which lid the tumor had been. This tells the story of the specific effect on disordered cells called tumors; where the healthy part was engulfed and lost in a malignant growth, whose wrong growing cells, being weaker, melted away under radium rays, and allowed a reassembling of the original healthy ones and restoration of the eyelid under its healing action.

This selective action against diseased tissue is now an accepted fact; alongside of that, however, is the discovery that many kinds of cells have such different degrees of resistance that only a few types of tumor yield to radium. The popular cry for a cancer cure is not met by any claim that its most ardent advocates can make for radium. This is not because the early growth of cancer cells is not controlled by radium, but because by the time the neglected trouble is brought to the notice of the surgeon, the system has been invaded beyond the reach of any remedy.

**Methods of Applying Radium.**— Very highly condensed radium salts in the form of carbonate, chloride, sulphate or bromide are incorporated with varnish and spread on metal surfaces of small size,— half an inch or one inch in diameter — or better still, fused with powdered glass in an indestructible enamel on a small metal surface; or the radium powder may be put in very fine glass tubes an inch long and as large as a steel knitting-needle; or, if dissolved in water, it will yield radium emanation which may be collected and condensed into glass capillary tubes scarcely larger than a pin, which, when protected by a delicate silver case, may be buried in tumors or laid upon the surface. Again, the minutest solution of radium in sterile water may be injected beneath the skin with a hypodermic needle and a systemic effect can be produced,—(lowering of blood pressure, etc.); but the efficacy of this in any disease is, as yet, very problematical. Of late, also, there has been an attempt made to isolate the beta rays from radium, separated in large quantity in the magnetic field and projected upon diseased surfaces (psoriasis, etc.), with striking alterative effect. The beta ray has been demonstrated to be the efficient factor in radium work. All methods, however, of using this extraordinary agent are still subject to change.

Two facts are established: First, surface diseases can be treated by strong radium placed on the surface for a half hour, with gauze, paper or cotton interposed to the thickness of a quarter or of half an inch, as a filter to exclude the most irritating rays; second, when the disease is deep, insulation of the skin, which is a natural protector, prevents penetration of the efficient rays to a sufficient depth, without such a long application as would injure the skin, unless a thick screen of lead is interposed to cut off the burning rays and allow penetration of the gamma, which generate secondary beta rays.

About one-tenth millimeter of lead for every hour's exposure of small amounts of radium (up to 100 milligrams) is about the correct screen to affect deep structures. With these facts in mind experience will dictate the carefully gauged dosage of rays which must be discharged into the structure to produce a curative action.

Speculation would lead one to surmise that, if its curative effect lies in the negative electrons which radium supplies, the disease might be due to the loss of the negative charges. Granting that the force activating any living cell is a well-balanced positive and negative charge of electricity, the equipoise is re-established by restoring the lost part with permanent benefit. While physiologists are in doubt whether the chemical change in metabolism of living tissue creates electric action, or, whether latent electric forces engender chemical changes and biologic metabolism, it would seem that this clean-cut supply of one electric element, with its resultant good, brings us one step nearer to understanding why cells grow and why they grow wrong. Inferentially, electricity and not biological change is the primary driving force. In summarizing the acknowledged efficiency of radium results in surgical work, the most clear-out demonstration of its value is shown in the cure of many semi-malignant tumors of the skin — notably of face, scalp and hands; in the alterative and reducing effect on lymphoid structures, lymph gland tumors, lymphangiomata of tongue, parotid, thyroid and splenic tumors; in complete disappearance of bone myeloid tumors; in prompt and complete disappearance of papillomata — warts in any part, especially available in the larynx where one application is usually sufficient; in alterative and often curative effect in patches of chronic itching eczema, psoriasis, Paget's nipple, vernal catarrh and keloids.

The public call on scientific medicine to find a cancer cure has been met with untiring zeal by thousands of earnest students. One use of radium lies in helping to understand the subject better and to differentiate the various types of that multiform disease; but as yet its use meets with a limited response. There is undoubtedly a curative action on small groups of cancer cells when found in nests in the neighborhood of larger growths. It may also be said that when radium is buried in the area from which a cancer has been imperfectly removed, it has sometimes shown curative action and has prevented recurrence, but as a weapon against considerable cancer masses it is not yet available. In mixed cancer tumors where adenoid structure exists, as in adeno-carcinoma of the rectum, it has a marked retarding value when properly used. Exact methods of applying this powerful agent have yet to be formulated and great experience and judgment are necessary to obtain the beneficial action of this remedy.

Robert Abbe, M.D.

**RADIUS,** the bone of the fore limb of vertebrate animals, which, as in man, when the arm is laid flat with the palm upward, lies to the thumb side of the limb. This side is, therefore, termed the *radial* side of the limb, in contradistinction to the *ulnar* or opposite side, so named from the ulna or neighboring bone, which, with the radius, constitutes the forearm. See Arm.

**RADIUS,** *in geometry.* See Diameter.

**RADIUS BAR,** or **RADIUS ROD,** one of the guiding-rods in a parallel motion, jointed to the connecting links, to counteract the vibratory motion communicated by the beam by guiding the links so that the head of the piston rod may reciprocate in a line sensibly straight.

**RADIUS OF CURVATURE.** See Curves of Double Curvature.

**RADIUS VECTOR.** See Mathematics.

**RADIX.** See Root.

**RADOM,** rä'dōm, Poland, (1) city and capital of the government of same name, on the right bank of the Radomka (or Mleczna) and on the Ivangorod-Dombrova Railroad, 100 miles south of Warsaw, and one of the best-built provincial towns. Its special features are an ancient church and convent and the ruins of an old castle. The town is supposed to have been founded about 1350 by Casimir the Great, king of Poland. It has played an important part, at various times, in the history of Poland (q.v.), being frequently the seat of Polish diets. It was captured by the Germans in the early part of Great War. Its manufactures are of tin, oil, vinegar and leather. Two fairs are annual attractions. Pop. about 50,730. (2) The government covers an area of 4,768 square miles, and has a population of 1,180,200, chiefly Catholics. Its chief rivers are the Vistula and Pilica. It is divided into seven districts. Although there are extensive marshes, a large part of its soil is very fertile, about 50 per cent being under cultivation and 28 per cent under forests. Wheat, rye, barley, oats, buckwheat, hemp, flax and potatoes are the main crops and a considerable amount of grain is exported. There is also extensive raising of livestock. The government is rich in iron ore and other minerals and important industrial establishments employing some 75,000 workmen have been developed.

**RADOWITZ, Joseph Maria von,** Prussian statesman: b. Blankenburg, Germany, 6 Feb. 1797; d. Berlin, Germany, 25 Dec. 1853. He was of a noble, originally Hungarian, family, and in 1812 entered the Westphalian army as an officer and was wounded and taken prisoner in the same year at the battle of Leipzig. In 1823 he entered the Prussian service, and in 1830 became chief of the general staff of artillery and a leader of the anti-revolutionary party. He subsequently held diplomatic posts at Carlsruhe, Darmstadt and Nassau, was the confidant and adviser of King Frederick William IV, and after the revolution of 1848 supported the efforts of Prussia to give a constitution to Germany. For a few months in 1850 he was Prussian Minister of Foreign Affairs. In August 1852 he became Director of Military Education. He wrote several works, mainly political, which include ‹Ikonographie der Heiligen, ein Beitrag zur Kunstgeschichte› (Berlin 1834); ‹Gespräche aus der Gegenwart über Staat und Kirche› (Berlin 1846); ‹Deutschland and Friedrich Wilhelm IV Devisen and Mottos des Späteren Mittel-Alters› (Berlin 1850); ‹Neue Gespräche aus der Gegenwart› (Berlin 1851). Consult Frensdorff, E., ‹Joseph von Radowitz› (Leipzig 1850); Hassel, ‹Joseph Maria von Radowitz (Berlin 1905); Lilieucron, R. von, ‹J. M. von Radowitz› (in ‹Allgemeine Deutsche Biographie,› Vol. XXVI, p. 141, Leipzig 1888).

**RADZIWILL,** räd'zē-vīl, ancient, very wealthy Lithuanian-Polish family, descended from Nicholas I (1366–1446), voivode of Vilna. Its members became princes of the empire in 1556. Among its most famous members are: (1) Nicholas VI the Black, son of John the Bearded and palatine of Vilna (1515–65), from whom the modern Radziwills are descended. King Sigismund Augustus gave him the command, in 1552, in the war against the Polish knights. He also commanded in the war against Russia in 1561. Having become a convert to the Reformation, he financed the translation of the Bible into the Polish tongue and its publication (Biblia swieta, Brzesc 1563). (2) Christopher II, military governor of Lithuania and palatine of Vilna, b. 1585; d. 1640. After the death of Sigismund, in 1632, he undertook the defense of the Protestants at the diet of Warsaw and obtained complete toleration for them. Enjoying the confidence of Vladislav IV, he commanded in the war against Russia. (3) Boguslav, Prince Radziwill, son of Prince James and Sophie Elizabeth, margravine of Brandenburg, was governor in Prussia, 1657–69, and rendered important services in endowments to universities and schools. (4) Charles, Prince Radziwill, palatine of Vilna and grand-commander of Lithuania: b. 1734; d. 1790. He was the enemy of Czartoryscy and the Russians and an adherent of the Saxon party. He was an ardent supporter of the Confederation of Bar and was several times exiled. For three years he was a member of the constituent diet at Warsaw. In more modern times many of the members of the family have occupied important military, diplomatic and political posts at the Prussian court. Some branches of the family, however, attached themselves to the Russian court. (5) Michael Geron, Prince Radziwill (1778–1850) fought under Kosciuszko and Napoleon I against the Russians. (6) Elsie, Princess Radziwill (1803–34) became the object of a youthful love on the part of William I, German Emperor. Her nephew, (7) Anton (1833–1904) was attached for many years to the immediate entourage of the latter. Consult Anon., ‹Die historische Stellung des Hauses Radziwill› (Berlin 1892).

**RAE,** rā, **Charles Whiteside,** American naval engineer: b. Hartford, Conn., 30 June 1847; d. Washington, D. C., 13 May 1908. He was graduated at the Rensselaer Polytechnic Institute in 1866 and at the United States Naval Academy in 1868. He remained in the navy, receiving regular promotion, becoming captain 3 Jan. 1903. In the Spanish-American War he served at the bombardment of San Juan, Porto Rico, and at the naval battle of Santiago, 3 July 1898, receiving a medal and promotion for his services. He was appointed engineer-in-chief of the United States navy, with rank of rear-admiral and chief of the Bureau of Steam Engineering in the Navy Department, 9 Aug. 1903.

**RAE,** rā, **John,** Scottish explorer: b. near Stromness, Orkney Islands, 30 Sept. 1813; d. London, 22 July 1893. He studied medicine at Edinburgh, became surgeon in the Hudson's Bay Company's service in 1833, and from 1835 till 1845 was the company's resident surgeon at Moose Fort. In 1846–47 he made his first exploring expedition, covering 700 miles of the northern coast of America along Committee Bay. He then went to London and in 1848–49 accompanied Sir John Richardson in his Franklin search in the Mackenzie and Coppermine region. He conducted two expeditions in 1851, during the first of which he explored a large part of the coast of Wollaston Land. During the second he traveled a distance of over 5,000 miles in eight months and explored much of the coast of Victoria Land. In 1853–54 he again conducted an expedition and discovered the first traces of Franklin's fate, for which the party received the government grant of £10,000. He also proved King William's Land to be an island. In 1858, 1860 and 1864 he was member of expeditions to the American Arctic regions. In all he walked 23,000 miles and explored coast lines aggregating over 1,700 miles. Consult Richardson, ‹Arctic Expeditions› (London 1852–53) and ‹Polar Regions› (ib. 1861). He published ‹Narrative of an Expedition to the Shores of the Arctic Sea in 1846–47› (1850).

**RAEBURN,** rā'bėrn, Sir **Henry,** Scottish portrait painter: b. Stockbridge, near Edinburgh, 4 March 1756; d. there, 8 July 1823. He was left an orphan at an early age and was apprenticed to a goldsmith, who, perceiving his talent for drawing, encouraged him in his ambition to be an artist. The favorite portrait painter in Edinburgh at that time was David Martin, who was the only instructor Raeburn ever had. He formed his style, however, by copying in color, mezzotints from the paintings of Sir Joshua Reynolds, and while he learned the chiaroscuro of that master he never attained his almost Italian richness and solidity of coloring. His drawing was correct, but unfortunately acting under the idea that a portrait was to be viewed at some distance above the level of the eye, he foreshortened the forehead and brought forward the nostrils and lower jaw. Thus Sir Walter Scott complained that his portrait by this artist caused him to look «clownish and jolterheaded.» Acting on the advice of Reynolds, Raeburn spent two studious years in Italy (1785–87) which resulted in a marked improvement in his coloring, which had previously been thin and undecided. Wilkie actually wrote from Spain that the execution of Velasquez reminded him of Raeburn. His ‹Portrait of Mr. William Forsyth› in the New York Metropolitan Museum is a fair specimen of his style and there are two pictures of his in the New York public library. Another fine portrait may be seen in the Art Museum, Worcester, Mass. He confined his serious artistic efforts entirely to portraits and painted every eminent Edinburgh man of his day. Among his sitters were Jeffrey, Stewart, Braxfield, Erskine and Sir Walter Scott. In 1812 he was made president of the Royal Society of Artists of Scotland and three years later was elected to the Royal Academy. He was knighted by George IV in 1822. The public galleries of Edinburgh and Glasgow have several of his works. He is also well represented in the National Gallery, London, the Royal Academy and many private collections in England. The Morgan collection (New York) contains two of his masterpieces. Consult Armstrong, W., 'Sir Henry Raeburn' (London 1901); 'Masters in Art' (Vol. VI, Boston 1905); Clouston, R. S., 'Sir Henry Raeburn' (New York 1907); Greig, James, 'Sir Henry Raeburn: His Life and Works' (London 1911).

**RAFF**, räf, **Joseph Joachim**, Swiss composer: b. Lachen, Switzerland, 27 May 1822; d. Frankfort-on-the-Main, 24 June 1882. He was educated at Wiesenstetten in Würtemberg and at the Jesuit Lyceum in Schwyz, and gained the notice of Mendelssohn and Liszt. In 1850 he removed to Weimar in order to be near Liszt, and his opera 'König Alfred' was shortly afterward produced at the Court Theatre there with great success. In 1877 he was appointed director of the Conservatoire at Frankfort, a position he occupied until his death. He was an indefatigable worker, his compositions numbering over 200, and his reputation rests chiefly upon his symphonies, among which are 'Im Walde'; 'Lenore'; 'An das Vaterland,' etc. He was also very successful as a song-writer, and a notable composer of instrumental pieces, but his three operas were less successful. Though not confining himself to any one style of composition, he was a supporter of the Wagner school.

**RAFFAELLO**, rä-fä-ĕl'lō. See Raphael.

**RAFFIA.** See Fibre.

**RAFFLES**, răf'lz, Sir **Thomas Stamford**, English colonial administrator: b. at sea, off Point Morant, Jamaica, 5 July 1781; d. Highwood, near London, England, 5 July 1826. He was employed in the East India House as a clerk when 14, soon attracted attention by his ability and in 1805 was appointed assistant secretary at Penang. He mastered the Malay language while on the voyage and in 1807 was appointed secretary and registrar of the Recorder's Court. He visited Malacca in 1808, and in 1810 went to Calcutta where he met Lord Minto, the governor general, and by his advice the expedition against Batavia was fitted out in 1811. He accompanied Lord Minto to Java in that year and after its capture from the Dutch became its lieutenant-governor, an office which he held for five years. His administration was eminently wise and successful; he retained the Dutch colonial laws, but abolished forced labor and instituted marked improvements in taxation and the administration of justice. He returned to England in 1816 when the island was given up to the Dutch, was knighted and commissioned by the prince regent to proceed to Holland to confer with its king in regard to the government of Java. In 1818 he was appointed governor of Benckulen in Sumatra, where he found many abuses existing. He abolished slavery, reorganized the government of the colony, founded schools and otherwise greatly improved the condition of the island. He explored with Joseph Arnold the interior of the island and discovered the great fungus named in their honor *Rafflesia Arnoldi*. Ill health compelled his return to England in 1824 and on the voyage the ship caught fire, destroying his natural history collection, manuscripts, drawings and notes valued at $100,000. He was first president of the Zoological Society. He published 'History of Java' (1817), and 'Malayan Miscellanies' (1820–22). Consult Lady Raffles, 'Memoir of Sir T. S. Raffles' (1830); Egerton, 'Sir Stamford Raffles' (in 'Builders of Great Britain' series).

**RAFFLESIA**, an East Indian genus of parasitic plants, reduced to apetalous diœcious flowers and named after Sir Stamford Raffles, the discoverer. *R. Arnoldi* was the first species discovered in Sumatra. It is a gigantic flower, springing from the roots or stems of *Vitis (cissus)*, three feet in diameter and consisting of a globular central cup, containing either the ovary, or the numerous stamens, crowned by a ring, and the five-lobed calyx, fleshy and flesh-colored, blotched with pink and yellow inside and with brownish or bluish scales exteriorly. The whole flower sometimes weighs 15 pounds. It remains expanded for a few days only, and then decays, emitting a putrid odor that attracts carrion-loving flies, which probably assist in cross-fertilization. The fruit is a brown, rough surfaced nut, holding innumerable seeds. Certain Javanese species are valued there as powerful styptics.

**RAFINESQUE**, rä-fē-nĕsk', **Constantine Samuel**, American botanist: b. near Constantinople, Turkey, 1784; d. Philadelphia, Pa., 18 Sept. 1842. He was of French-German parentage and was sent to America in 1802 where he made botanical investigations in Pennsylvania and Delaware and in 1805 returned to Turkey with botanical specimens. While sailing for the United States in 1815 he was shipwrecked off the coast of Long Island and lost his collection of 20 years. He settled permanently in the United States in 1815, and was made professor of botany in Transylvania University, Lexington, Ky., in 1818. Later, after lecturing in various places, he removed to Philadelphia. He was a man of wide learning, but his work is in many instances rendered confusing by his insatiate desire for novelties, and though evincing keen insight is frequently inexact. His publications include 'Ancient History, or Annals of Kentucky' (1824); 'Medical Flora, etc., of the United States' (1828–30); 'A Life of Travels and Researches in North America and South Europe' (1836); 'Pleasures and Duties of Wealth' (1840), etc. Consult Call, R. E., 'Life and Writings of Rafinesque' (Louisville 1895).

**RAFT**, a floating platform, usually composed of wooden logs or planks, fastened together by nails, spikes or cordage, and used either as a vehicle of travel and for the carriage of goods, or more generally for the purpose of transporting by river, lake or sea the materials composing the raft from the place of its construction to a market for sale. In all probability the raft was the first human method of travel on water, next to floating on a large branch or tree-trunk, the use of which would naturally suggest the raft, just as a raft, with sail of skin or other material raised to catch the wind, would suggest the first rude sail boat or ship. Rafts have been in use in all historic ages, and doubtless far back in the prehistoric period, but they reached their most general use after the settlement of North America, when the vast forests were being cleared by settlers, and the raft offered almost the only method by which the pioneer on the Ohio or Mississippi could reach the settlements on those rivers, dispose of his surplus products, and buy some of the comforts and perhaps luxuries to be obtained in the towns. The steamboat has almost entirely done away with the raft as a means of travel, but rafting is still the chief method of conveying the lumber product of northwestern forests to market, and immense rafts are sometimes sent by sea from Maine to New York or Boston. On the Pacific Coast also the rafting business is most extensive. In the fall of 1902, a monster raft 700 feet long, 53 feet wide, 12 feet from the water's edge to the top, and drawing 22½ feet of water was safely towed 700 miles from Columbia River to San Francisco. The logs were 120 feet long, and from 12 to 20 inches in diameter, and there were in all 7,000 pieces, valued at $60,000. The construction of a raft of this size is a vast undertaking. A great «cradle» of heavy timbers is built on a slough connected with the Columbia River. A row of piling is driven in deep water, and the frame of the cradle floats up and down on the row of piling, and is held in place by it. A large scow with a derrick is anchored beside the cradle. Log-booms or small rafts are towed to it, and the logs are lifted by the derrick into the cradle, where they are fastened with chains and cables, from 80 to 100 tons of chain being used on one raft. When the raft is finished the keys that held the parts of the cradle together are drawn, the side of the cradle is pulled away, and the raft floats out on the water. Tugboats draw it into and down the Columbia, and out to sea on its voyage to the Golden Gate.

**RAGATZ,** rä'gäts, Switzerland, a fashionable Spa in the province of Saint Gall on the Tamina, celebrated for its hot springs, mineral waters and scenery. About 50,000 tourists visit Ragatz every year. Pop. 2,063. See PFAFERS.

**RAGGED ROBIN.** See LYCHNIS.

**RAGGED SCHOOLS,** a name given in Great Britain to those institutions supported by voluntary contributions for the education of neglected children and the consequent prevention of juvenile crime. The idea of forming such schools was due to a Portsmouth cobbler, John Pounds, who about 1819 began to take in the ragged children of the district in which he lived and teach them while he was at work. This he continued till his death in 1839. The success of the plan caused a number of more influential persons to take the matter up, and in 1838 a ragged Sunday-school was opened in London. In 1841 the first feeding-school, in which the children are not only educated but kept and fed for the day, was started in Aberdeen. What gave a greater impetus than anything else to the ragged school scheme was Dr. Guthrie's ‘Plea for Ragged Schools,’ published in 1847. It had an immense circulation, and was followed by the extension of the system to every considerable town in the kingdom. The name ragged schools was first adopted in 1844. Owing to the education acts, and especially the introduction of compulsory school attendance and abolition of fees, many of these schools were absorbed by the school-boards, and generally they may be said to be a thing of the past.

**RAGHUVAMŚA,** ră-g-hoo-văṅ'shạ, one of the two epics of the Sanskrit poet Kâlidâsa (q.v.). Its subject is the legendary history of the solar kings, or kings descended from the sun. See SANSKRIT LITERATURE.

**RAGIE,** a grain. See ELEUSINE.

**RAGLAN, Fitzroy James Henry Somerset,** LORD: b. 30 Sept. 1788; d. Sebastopol, 28 June 1855. In 1804 he entered the army and in 1807 served on Wellington's staff in the expedition to Copenhagen, while throughout the Peninsular campaign he served as military secretary. In 1814 he acted for a short time as secretary to the embassy at Paris, and from January to March 1815 was minister plenipotentiary there. At Waterloo he lost his right arm. From 1827 to 1852 he was military secretary at the Horse Guards, in 1852 became master-general of the ordnance and in October of that year entered the House of Peers as Baron Raglan. He was commander of the English forces in the Crimean War, where he suffered much from the early failures of the campaign and from the hostile criticism of the inefficient commissariat arrangements. Consult Kinglake, ‘Invasion of the Crimea.’

**RAGMAN ROLLS,** documents containing a record of the acts of allegiance extorted by Edward I of England from the nobility and gentry of Scotland in 1291–92 and 1296. The document was delivered back to the Scotch along with other records and muniments in 1329 in terms of the Peace of Northampton, when the independence of Scotland was formally acknowledged. It is now deposited in the British Record Office.

**RAGNARÖK,** räg"nạ-rėk, in Scandinavian mythology the day of doom when the present world will be annihilated, to be reconstructed on an imperishable basis. The title of the concluding portion of Wagner's great operatic trilogy ‘Götterdämmerung’ is a translation of this word. In that work is depicted the downfall of Woden and the gods and the triumph of perfect human love. William Morris also treats this subject in his ‘Sigurd the Volsung.’ ‘Ragnarök’ is the title of a novel by Ignatius Donnelly.

**RAGOZIN,** rä-gō'zēn, **Zenäide Alexeievna,** Russian-American writer: b. Russia, 1835. She traveled widely in Europe and in 1874 came to the United States. She is a member of the leading American and European literary societies, and has achieved a wide reputation as an author. Her most important books are ‘The Story of Chaldea’ (1886); ‘The Story of Assyria’ (1887); ‘The Story of Media, Babylon, and Persia’ (1888); ‘History of the World’; ‘Siegfried, the Hero of the Netherlands’ (1898); ‘Roland, the Paladin of France’

(1899); ‘Salammbo, the Maid of Carthage’ (1899).

**RAGS**, though valueless for most purposes, are yet of great importance in the arts, particularly in paper making. Woolen rags of a loose texture, and not too much worn, are unraveled by means of machinery, and mixed up with good wool, to form what is known as «shoddy,» with which cheap woolen goods are made.

**RAGTIME**, a musical term of American origin signifying a rythm or movement of inversions of emphasis and irregular accents, a sort of continuous syncopation and somewhat similar to «Scotch catch» or «snap.» It was formerly applied to the negro melodies of southern United States and to songs and dances caricatured from them, but has been extended in colloquial use to cover any popular song of similar melody. The music itself is supposed to have originated through the limitations of the crude African musical instruments, the emphasized accents being effective on instruments of percussion.

**RAGUENEAU**, räg-nō, **Paul**, French missionary and explorer: b. Paris, 1608; d. there, 3 Sept. 1680. He joined the Jesuit order, and went to Canada in 1636 to work among the Indians, first visiting the Hurons. In 1640 he made an unsuccessful attempt to secure the release of French prisoners from the hostile Iroquois. Becoming the head of the Jesuit missions in Canada in 1650, he brought the remnant of the Hurons to Quebec to escape the Iroquois. On a visit to the Onondaga tribe of Iroquois he nearly lost his life. His chief success was with the Hurons, with whom he labored until 1666, when he returned to France and acted as agent for the Canadian missions. He wrote ‘Vie de la Mère St. Augustine, religieuse, Hospitalière de Quebec en la Nouvelle France’ (1672); ‘Relacion de ce pui s’est passé de plus remarquables ès Missions des Pères de la Compagnie en la Nouvelle France’ (1647–57), the latter work covering the years 1645–52 and 1656–57. Consult Parkman, ‘The Jesuits of North America’ (1867); ‘The Jesuit Relations’ (1896–1901).

**RAGUET**, rä-gā′, **Condy**, American political economist: b. Philadelphia, Pa., 28 Jan. 1784; d. there, 22 March 1842. He was educated at the University of Pennsylvania, studied law, and later entered upon a commercial career. He went to Santo Domingo in 1804 as supercargo on a vessel and made a second voyage to that island in 1805. In 1806 he went into business on his own account and was eminently successful, amassing an immense fortune and playing an important part in the commercial affairs of the day. In 1812 he was active in providing for the defense of Philadelphia against the expected attack of the British fleet, and in 1815 was elected to the State legislature where he subsequently served in both houses. He was appointed United States consul at Rio Janeiro in 1822 and in 1825 became *chargé d'affaires* to Brazil, an office he occupied until 1827. After his return to the United States he edited several journals devoted to free-trade doctrines, among them *The Free Trade Advocate* in 1829; *Examiner* in 1834–35; *The Financial Register* in 1837–39; he also published two small volumes relating to Santo Domingo; ‘Principles of Free Trade’ (1835); ‘On Currency and Banking’ (1839), etc.

**RAGUSA**, rä-goo′sä (Slavic, Dubrovnik), a seaport town of southern Dalmatia, Jugo-Slavia, on the Adriatic. It lies at the foot and on the slopes of Monte San Sergio and its streets rise in terraces from the Corso, the principal thoroughfare, which traverses the centre of the city. There are old walls flanked with towers and a fort erected during the French occupation in the beginning of the 19th century. Among the notable public buildings are the cathedral dating from the first years of the 18th century; the new Greek church; the older churches of the Franciscans, Dominicans and Jesuits; the town-hall, anciently the governmental palace, completed in the early part of the 15th century after nearly 100 years in building, and forming a magnificent example of the Gothic-Venetian style; and the Dogona, of the same architectural type. The industrial interests of the town comprise chiefly manufactures of silk, leather and liqueurs. The coasting trade is important, but owing to the shallowness of the harbor, centres chiefly at Gravosa, some four miles to the north. The population is about 14,291. Ragusa was founded in the 7th century by refugees from the ancient Epidaurus, now known as Ragusa Vecchia, when that city was destroyed by the Slavs. Ruled in turn by the Byzantines, the Venetians and the Hungarians, it acquired in the 13th and 14th centuries, through trade and unscrupulous diplomacy, lordship over a territory of some 750 square miles and maintained its existence as an aristocratic republic, paying tribute, after 1440, to the Turks. The prosperity of the town was undermined by several epidemics in the 16th century and by repeated earthquakes of which that of 1667 was the most disastrous. In 1806 Ragusa was occupied by the French, two years later the republican form of government was abolished, and in 1809, with the rest of Dalmatia, it was annexed to the Illyrian kingdom. In 1814 it passed to Austria. The see of Ragusa was founded in 980, and from 1121 to 1831 it was the seat of a Roman Catholic archbishop. Under the European Peace Treaty of 1919, Ragusa passed from Austria to the new republic of Jugo-Slavia.

**RAGUSA**, a town of Sicily, in the province of Syracuse, on the mountain stream Erminio, some 30 miles west-southwest of Syracuse. It has considerable manufactures of cotton and other textiles, oil, furniture and asphalt and carries on an important trade in corn and wine. It comprises two communities, Ragusa proper with a population of about 32,000, and Ragusa Inferiore with 7,850 inhabitants. Ragusa is supposed to be the ancient Hybla Heræa.

**RAGWORT**, any of various composite weeds of the genus *Senecio*, common in most parts of the world. These coarse, yellow-flowered plants are allied to the thistles, and some of the numerous American species are known as squaw-weed, ragwort, and butter-weed, and in England as groundsel. See Senecio.

**RAHL**, räl, **Karl**, Austrian painter: b. Vienna, 13 Aug. 1812; d. there, 9 July 1865. At 19 he won a prize at the Vienna Academy and then started on his first tour among the art centres of Germany, Hungary and Italy. He made his home in the last-named country from 1836 to 1843, studying especially the painters of the Venetian and Roman school, from whom he derived the grandeur of conception and noble coloring for which his works are distinguished. In 1846, after two years' residence as a portrait painter in Vienna, he resumed his travels and practised his art with success and profit in Holstein, Paris, Rome, Copenhagen and Munich. Among his historical paintings of this first period are ‹The Finding of Manfred's Body›; ‹Manfred's Entrance into Lucera›; ‹The Catacombs during the Persecution› (in the Hamburg gallery and a replica in the Berlin National Gallery). He was appointed professor in the Berlin Art Academy in 1850, but his political opinions were extreme and violent and he was compelled to leave the city. The private school which he thereupon opened became the most important seminary of painting in Austria. He meanwhile applied himself to much decorative work, as is testified by the painted façade and vestibule of the church in the Old Meat Market at Vienna, the four compositions from the Greek heroic age, and the ‹Four Elements› in the palace of Baron Sina. In 1864 he painted in the Museum of Arms a series of allegorical figures of heroic size. To this period belong his fresco, ‹A Maid from Foreign Lands›; and the designs for a ballroom in Oldenburg Castle and ‹Incidents of the Argonautic Expedition.› His last works consisted of designs for the decoration of the New Opera House at Vienna. These were executed by his pupils after his death. He unites in his pictures the rich coloring of Rubens and Titian with a harmony of grouping monumental in its impressiveness. Yet his handling of form inclines to coarseness and exaggeration. Among the most eminent of his pupils were Bitterlich, Eisenmenger, Lotz, Griepenkert, Gaul and Than. Consult George-Mayer, ‹Erinnerung von Karl Rahl› (1882).

**RÁHU,** rä'hoo, in Indian mythology the demon who is imagined to be the cause of the eclipses of sun and moon. Rahu, having stolen of the nectar of immortality, was caught and beheaded before he swallowed the divine stuff. The head thus became immortal, and ever afterward followed the sun and moon. When it occasionally caught them an eclipse resulted.

**RAHWAY,** râ'wā, N. J., city, in Union County; on the Rahway River, and on the Pennsylvania Railroad, about 20 miles southwest of New York City. It is a residential city, and its clean, well-laid-out streets, its parks and fine residences make it an attractive suburb. It has considerable manufacturing interests; the chief establishments are chemical works, printing houses, shirt factories, lace curtain factories, felt mills, steel works, cereal products and music-box factories. There is a large trade in manufactured articles, fruit and vegetables. It has a high school, public and parish schools and a library, which has about 20,000 volumes. The old Revolutionary name of the locality was Spanktown, and in January 1777 a skirmish took place, noted in some histories as the battle of Spanktown. Pop. 11,042.

**RAI BARELI,** rī bä-rā'le, India, (1) principal city of a district of the same name, on the banks of the Sai, 48 miles southeast of Lucknow. It has a spacious fort, a magnificent palace, four fine mosques and the tomb of Nawab Jahan Khán. Pop. 18,798. (2) The division of Rai Bareli is now part of the united provinces of Oudh and Agra, and has an area of 1,751 square miles. Pop. about 1,100,000.

**RAI SANYO,** rī sän'yō, Japanese historian: b. 1780; d. 1833. He spent 20 years in preparing his ‹Nihon Gwaishi› (‹History of Japan Outside the Court›), which was published in 22 volumes in 1827. It is a compilation gathered from a vast number of Chinese and Japanese works of history and covers the history of the Shogunate from its origin in the 12th century down to the setting up of the Tokugawa dynasty in the early 17th century. A second work, ‹Nihon Seihi,› in 16 volumes, was published in 1837, after Rai Sanyo's death. From a literary standpoint his works are of little interest, no attempt being made at anything more than a dry chronological record of events. Their political effect, however, was of inestimable importance. Strongly imperialistic in sentiment the presentment of the nation's history before the usurpations of military feudalism was used with tremendous effect in re-establishing the power of the throne. The first five volumes of ‹Nihon Gwaishi› were translated by Sir Ernest Satow (1872). Consult Aston, W. G., ‹History of Japanese Literature› (1899).

**RAIATEA,** rī-ā-tā'ä, Polynesia, an island of the Society group, northwest of Tahiti; area, 75 square miles. It is mountainous (3,400 feet), but fertile, and traversed by many streams. The chief products are cotton and copra. Pop. (Protestant) 2,300.

**RAIBOLINI,** rī-bō-lē'nē, **Francesco.** See Francia, Francesco.

**RAID OF RUTHVEN,** a mysterious event in Scottish history, which took place in August 1600. John Ruthven, Earl of Gowrie, and his brother, Alexander, then resided on the former's estate at Perth. The earl was bitter against James VI (later James I of England) who had put the earl's father to death for treason and who was in Ruthven's debt for a large sum. On 5 Aug. 1600, the king with a few attendants visited Ruthven's residence in order, as Alexander alleged, to confer with the earl in regard to the debt. After dinner the Ruthvens contrived to separate the king and his attendants, bringing the former into a private study and taking the latter into the garden. The guests were soon informed that the king had ridden off and the earl left them for a moment and soon returned and confirmed the report. While the guests were puzzling over the circumstance, they heard the king shouting «Treason!» from the study window. Suspecting a plot four of them rushed to the study where they found Alexander Ruthven struggling with the king. They killed Alexander, after which the earl and his servant, Cranston, rushed upon them and fought desperately to avenge his brother. However, he was overpowered and killed. In the study the king had found a man in armor, who, it was later said, was Henderson, chamberlain of the earl. As Henderson had offered no violence to the king he was pardoned. Three of the servants were hanged for their part in the conspiracy, the Ruthven estates were confiscated and the castle, in which the attack took place, was destroyed. Considerable mystery surrounds the strange event. The suggestion has been made that Queen Elizabeth, who may have wished to secure the king's person and to rule Scotland in his name, used the Ruthvens as tools to accomplish this end. Others have suggested that there may have been no plot — merely a quarrel over the debt which led to the death of the Ruthvens, after which the king concocted the story of the plot to hide his own guilt. Consult 'Register of the Privy Council of Scotland' (VI); Barbé, 'Tragedy of Gowrie House' (Paisley 1887); Lang, 'James VI and the Gowrie Mystery' (London 1902); 'History of Scotland' (Vol. II, Edinburgh 1902); Burton, 'History of Scotland' (ib. 1867–70); Brown, Hume, 'History of Scotland' (Vol. II, Cambridge 1909).

**RAID,** *in international law,* an unauthorized invasion by an armed force of the territory of a state not at war. A raid must be carefully distinguished from an invasion, for in the latter either regular forces of a foreign state or regular forces of a body exercising its powers by delegation of that state must be guilty of the overt act. If so, it constitutes an act of war, whereas a raid, being unauthorized and unrecognized by any state, is not an act of war. The punishment of the offenders, if captured, is, therefore, very different. In case of invasion, they are treated as prisoners of war, but in case of a raid the offenders, if captured, are subject to the local law. The state invaded may compel compensation from the offending state or may retaliate by similar acts or by declaring war, but this is not true in the event of a raid.

Among the most famous of raids was that of Dr. Jameson (q.v.) who forcibly entered the Transvaal in 1895 at the head of an armed force of 600 men, and was one of the causes of the war that followed between the republic and Great Britain. Dr. Jameson's force was captured by the Boers and turned over to the British for punishment.

Among other raids may be mentioned those claimed to have been instigated by General Villa, head of the Mexican rebel forces, in the spring and summer of 1916, into territory in the southwestern part of the United States.

**RAIFFEISEN,** rīf'ī-zĕn, **Friedrich Wilhelm,** German economist, famed as the father of the peoples' banks: b. Hamm, near Coblenz, Germany, 30 March 1818; d. 11 March 1888. He entered the army in 1835, but was compelled by ill health to withdraw and then entered the civil service. During the agricultural troubles of 1846–47 he perceived the difficulty with which the small landholder procured credit and he conceived the idea of establishing small mutual credit associations which freed the farmer from the exorbitant rates of the usurers. His first efforts were at Heddersdorf and Wyerbusch and he then proceeded to extend the operation of the plan throughout Germany. In 1866 he broke down from overwork and retired for a time from public service. In 1878 he founded the «Landwirtschaftliches Genossenschaftsblatt» at Neuwied. He lived to see his plan in successful operation in Germany, Austria, Switzerland and Italy. He wrote 'Instruktion zur Geschäfts- und Buchführung der Darlehnskassenvereine' (1869); 'Kurze Anleitung zur Grüdung von Darlehnskassenvereinen' (1888), etc.

**RAIKES,** rāks, **Robert,** English founder of Sunday schools: b. Gloucester, England, 14 Sept. 1735; d. there, 5 April 1811. He succeeded to his father's business as editor and publisher of the *Gloucester Journal* in 1757 and used its influence in exposing certain prison abuses in his native town. In 1781 he founded several Sunday schools which he engaged needy women to teach at a shilling a day, and succeeded in inducing the attendance of the children of the city. In 1803, largely through his efforts, the Sunday School Union was founded. Consult Lives by Gregory (1877), and Eastman (1880); Harris, 'Robert Raikes: The Man and his Work' (1899). See Sunday Schools.

**RAIL BONDS.** See Electrical Terms.

**RAILROAD CARS.** See Railway Cars.

**RAILROAD CONSOLIDATION.** See Railway Consolidation.

**RAILROAD ENGINEERING AND CONSTRUCTION.** See Railway Engineering and Construction.

**RAILROAD LABOR ORGANIZATIONS.** See Railway Labor Organizations.

**RAILROAD AND OTHER LAND GRANTS.** Grants for railroad and other purposes were the subject of vigorous discussion from an early period of our history, many holding that the Federal government had no authority to grant subsidies for internal improvements. The decision reached was in favor of such subsidies. The first of the kind was made 30 April 1802 in the Enabling Act of the State of Ohio which provided that one-twentieth of the net proceeds of the sales of public lands in said State should be given to the State for constructing public roads. Grants of land in aid of the construction of canals were authorized in later years. The first aid for the construction of a railroad was 2 March 1833 when the State of Illinois was permitted by Congress to divert its canal land grant of 2 March 1827 for the construction of a railroad, but this grant did not become effective. The first definite grant of lands to aid in the construction of a railroad was the Act of 20 Sept. 1850 to the State of Illinois. A number of grants of lands to States followed as aids to railroads.

After 1850 and the admission of the State of California into the Union a strong agitation developed for the construction of a railroad to the Pacific Coast which resulted in the acts of 1 July 1862 making grants of lands to the Union Pacific Railroad Company, the Central Pacific Railroad Company and other roads. There were many subsequent land grants to railroads up to 1871.

The land grants to the States and railroads for railroad purposes provided usually for a grant of the odd sections within 6 to 10 miles on either side of the line of road. In some cases the grant was 20 miles in width on either side. In addition the roads were authorized to select indemnity lands where any portion of the main grant had been otherwise disposed of.

The total area granted to States for canal purposes was 4,597,804.37 acres. The total area patented for wagon roads under their grants as reported to 30 June 1918 was 3,242,173.75 acres. For the same date the area patented to States for railroad grants was 37,784,852.58 and for the same date to railroads was 85,927,123.63. The total area thus disposed of for public improvements to 30 June 1918 was 131,551,954.33 acres.

In addition to this, the granting acts authorized the issue of United States 6 per cent bonds in aid of the construction of the Pacific railroads on the basis of $16,000 per mile in the Great Plains east of the Rocky Mountains; $48,000 per mile for the portion crossing the Rocky Mountains; $32,000 per mile for the line through the Central Plains with similar grants to the Central Pacific for the western part of the line. These bonds of the United States were a second lien against the property of the companies.

The total bond issue for the Pacific roads was $64,623,512. All have made settlement except the Central Branch of the Union Pacific, which still owes the principal of the bonds, $1,600,000, and interest which amounted to $1,977,000 to 31 March 1919. This debt is being very slowly reduced by credits on account of the transportation of public property.

Morris Bien,
*United States Reclamation Service.*

**RAILROAD SHOPS AND MACHINERY.** See Railway Shops and Machinery.

**RAILROAD SPEEDS.** See Sports.

**RAILROADS OF THE UNITED STATES.** See Railways of the United States.

**RAILS AND RAIL SHOOTING.** Any birds belonging to the typical genera of the family *Rallidæ* are popularly called rails, probably in reference to their harsh rattling cries, but the name is more particularly applied to certain species, other being known as marsh hens, crakes, etc. The family is included in the order *Grallæ* or *Gruiformes.* The family is a large one composed of numerous species of moderately sized birds of generalized structure, found in most parts of the world. The body is compressed, the legs strong, the feet very large with long toes, which are lobately webbed in the coots, the wings and tail very short, the bill strong and variously shaped, but never greatly elongated nor provided with a sensitive tip, and the colors are usually obscure and sober. About 35 genera and 180 species of *Rallidæ* have been recognized, but authorities differ concerning the retention of some of the more aberrant forms within the family. Three subfamilies are represented in the North American fauna: the *Fulicinæ,* or coots, with lobate marginal webs on the toes and a horny frontal shield; the *Gallinulinæ,* or gallinules, with a frontal shield, simple toes and usually richly-colored plumage, and the *Rallinæ,* or typical rails, in which the family characteristics are best displayed and there is no frontal shield nor any webbing on the toes.

Most of the rails are marsh-loving birds, their long toes admirably serving to support them on the soft mud and their narrow compressed bodies facilitating movements among the stems of grasses and reeds. Owing to their skulking and largely nocturnal habits they are difficult to observe and, except by gunners, their abundance is not generally known. They run well and to escape danger trust to their ability to slip quietly into a place of concealment. They seldom fly and, owing to the shortness of the wings, only in a weak, uncertain manner, but nevertheless some of the species perform extensive migrations. In feeding they are chiefly carnivorous, but never probe the mud for worms, etc., in the fashion of snipes, nor strain it as do the ducks. The nest is usually a rude bulky platform of dried rushes, etc., slightly elevated above the wet ground and the numerous eggs are thickly spotted. The young are fully downy and are said not only to run but to swim well as soon as hatched.

Besides the corncrake (*Crex crex*), which occasionally wanders from Europe to our shores, 12 species of true rails occur within the boundaries of North America. They belong to two genera. The king rail (*Rallus elegans*) or fresh-water marsh-hen is our largest species, reaching a length of 18 inches and a wing expanse of two feet. It is known by the rich cinnamon and chestnut hues of the under parts and the strong streaking of the plumage above. This species is abundant in the fresh-water marshes of the eastern United States but, although occasionally seen in New England, is rather southerly. Except for its habitat and the character of its food, which consists largely of aquatic insects, leeches and wild rice in season, the habits of the king rail closely resemble those of the next species. In the salt-water marshes from Connecticut southward along the Atlantic and Gulf coasts the king rail is replaced by the well-known clapper rail or salt-water marsh-hen (*Rallus crepitans*), which is extremely abundant from New Jersey southward and is resident in the southern half of its range, but migratory northward. It inhabits the reed-covered marshes intersected by ditches and creeks which border so much of our coast within the beach line and its presence is especially evident during the breeding season when the loud clattering cry is heard incessantly both by day and night. All kinds of snails, crustaceans and worms inhabiting such regions constitute its food. The nest is a heap of dried reeds and grasses elevated just above the water by the side of a ditch and usually concealed by an artful overarching of reeds. As many as a dozen, but more frequently about eight eggs, are laid; they are oval, of a cream or buff color and thickly blotched with brown and lavender tints. The clapper rail is slightly inferior to the king rail in size and is of a blended grayish color tone, rather than a streaked red. Closely related species are the *R. obsoletus* of California and *R. scottii* of Florida. The Virginia rail (*R. virginianus*) is about 9 or 10 inches long and in color a perfect miniature of the king rail. Unlike the latter it inhabits salt and tide-water as well as inland marshes and is very widely distributed throughout temperate North America and southward. It is a regular migrant, in most of the Northern States and Canada remaining from April to September to breed. Although generally common, they are best known by their nocturnal and diurnal cries. In nesting and other habits they resemble the clapper rails, but the eggs are of course much smaller. The Carolina or sora rail or crake and the yellow rail belong to the genus *Porzana,* which differs from *Rallus* in having the bill short and stout instead of long and slender.

The former (*P. carolina*) is eight or nine inches long, brownish above and unspotted below, the latter (*P. noveboracensis*) is only about six inches long, with much yellow above and the breast spotted. Both appear to range widely in North America, but the former is everywhere a far more abundant bird. The sora, also erroneously called ortolan, is the best known and during the migrations the most plentiful of the rails in all suitable reedy marshes along the shores of lakes and rivers, and it breeds in similar localities in the Middle States and northward. A third related species, the black rail (*P. jamaicensis*), is rarely taken. The North American rails are all marsh birds, but the European corncrake prefer the cultivated fields, and in New Zealand and other Southern islands many remarkable forms of field rails and some curious flightless and burrowing species are found.

Rail-shooting in the autumn, when they, and particularly the Carolina rail, congregate in immense numbers in the river swamps, has many followers; but it can hardly be called a sport, being nearly on a par with the annual slaughter of reed birds which occurs at the same time and places. The method is very simple. Each gunner has an assistant who poles him about in a flat-bottomed boat or skiff through the creeks and passages which everywhere intersect the swamps. Usually this is done at high tide, owing to the shallowness of the creeks at other times and because the rising water restricts the area on which the birds can run. Sometimes spaniels or other dogs are employed to drive the birds, but this is unnecessary, as they are easily seen as they run along the banks of the creeks or rise in short labored flight. Enormous numbers, often running into the hundreds, may be secured by a skilful shot who has mastered the problem of shooting from an unsteady boat. During the gunning season the sora feeds largely on the seeds of reeds and wild grains, becomes very fat and is a truly delicate morsel. The other species are also sought but to a less extent. At times of unusually high tides great numbers of clapper rails are killed along the New Jersey coast as they huddle bewildered on little islands and masses of reeds in the flooded salt meadows. Immense numbers of the eggs of the same species are also gathered for food. Consult Baird, Brewer and Ridgway, ‹North American Water Birds (Boston 1884), and Roosevelt, ‹Game Water Birds› (New York, 1884); Newton, ‹Dictionary of Birds› (New York 1896); Evans, A. H., ‹Birds› (in ‹Cambridge Natural History,› Vol. IX, ib. 1900); Job, H. K., ‹Among the Water-Fowl› (ib. 1902) and Bulletin 128 of the United States Department of Agriculture (Washington 1914).

**RAILS AND STRUCTURAL SHAPES, Manufacture of.** One of the most important branches of the iron and steel industry is the manufacture of rails. Up to about 1855, all rails were made of wrought iron. In England beginning about 1767, various forms of cast-iron and wrought-iron rails were employed, the first being a grooved rail for tramway purposes, which was subsequently developed into the regular railway by the use of cast-iron flanged rails. The first wrought-iron rail was patented in England by Birkenshaw, in 1820, and on account of its peculiar form was known as the «fish-belly» rail. It was the first to be rolled in continuous lengths embracing several spans and was laid in cast-iron chairs spiked to stone blocks set at intervals of three feet. It weighed about 33 pounds per linear yard. Its manufacture by the rolling process, however, was quite difficult, and it was superseded by the «flat-foot» rail which combined a solid head with a flanged base and was laid by being fastened to timber sleepers or ties by spikes driven through the holes in the flange The flat-foot rail was followed by the bridge-rail, the double-headed rail and the bull-headed rail. The last named, although involving a great waste of metal, owing to the excessive thickness of the web, is used exclusively in England, while in the United States and almost all foreign countries the rail of the flanged T-section is universally employed. It was invented by Col. R. L. Stevens, in 1830, but the form in use in America is a modification suggested by the special committee appointed by the American Society of Civil Engineers, in 1893; while the form used in Europe is that invented by Sandberg. It is usually made in lengths of 30 feet, but rails as long as 60 feet are used to some extent. In weight it varies from 25 to 100 pounds per linear yard, according to the amount of traffic, the speed of transportation and the gradients and curves of the roads upon which it is used.

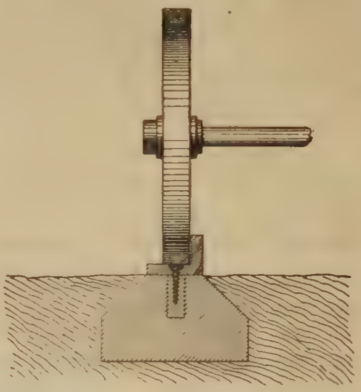

FIG. 1.—Tramway rail.

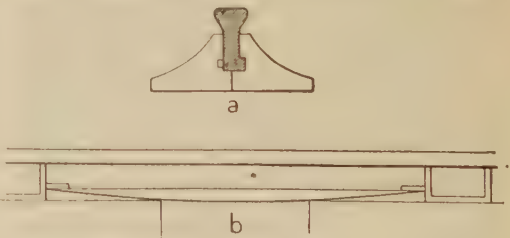

FIG. 2.—Fish-belly rail. (a) Section. (b) Side view.

About 1865, a few years following the discovery of the method of manufacturing Bessemer steel, rails of that material were experimentally rolled in the United States and soon began to supplant those of wrought iron. At the present time all rails are made of steel, and they have, probably, contributed more toward the rapid development of this country than any other single product of the steel industry. The raw materials consist of iron-ore, coke and limestone, mixed in proportion as follows — ore two pounds, coke one pound and limestone one and one-third pound. Two fundamental processes of manufacture are employed — the reduction of the ore in the blast furnaces and the conversion of the molten metal into steel in the converter, followed by the operations of the rolling mill. (See IRON AND STEEL INDUSTRY IN THE UNITED STATES). The Bessemer process of conversion is generally employed on account of its rapidity as compared with the open-hearth process, taken in connection with its capability to produce a grade of metal of a quality sufficiently high to satisfy the general specifications for rails. In the manufacture of steel rails, the work of smelting the iron in the blast furnaces is continued day and night, year in and year out, without intermission, but the converters and the rolling mills are generally shut down from 1.30 P.M., Saturdays, to 5 P.M., Sundays. During the intervening times, the product of the blast furnaces, instead of being poured into the mixers (by which the casts obtained from the different blast furnaces at varying temperatures and qualities are reduced to a common temperature and quality), are run into the pig-casting machine which consists of a series of parallel endless chains of molds arranged to pass in front of the pouring mouth of the ladle. The molds receive the metal at the lower end of the chain and deliver the casts at the upper end of the chain, where they are loaded upon railway cars for shipment.

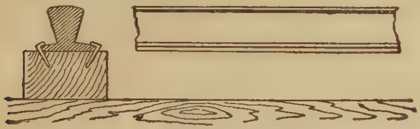

FIG. 3.—Flat-foot rail.

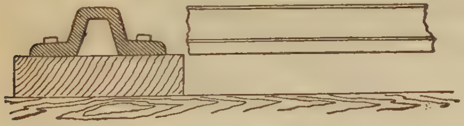

FIG. 4.—Bridge rail.

In the regular work, as soon as the ingot cast from the metal purified in the converters, is set, the mold is drawn from it by a hydraulic stripper and it is raised by an overhead electric crane and then lowered into the soaking pit, where it is brought to the proper temperature (white heat) for rolling. It is then taken to the blooming mill and passed through the blooms (rollers) seven times and reduced to a section varying in size according to the size of the desired rail. The section of the ordinary rail used on the railroads is nine and one-fourth inches square, and the ingot when rolled to that section attains a length of about 15 feet. It is then sheared into two or three lengths, as the case may be. These pieces called blooms after being heated in the bloom furnaces are carried to the rail mill, which consists of three sets of rollers — the roughing rolls, the intermediate rolls and the finishing rolls, through which the bloom is passed successively. Through the first set it is passed five times and reduced approximately to the section of the desired rail. It is then, without being reheated, passed five times through the intermediate rolls and reduced more closely to the desired shape. If the rail is of the lighter variety, weighing from 50 to 70 pounds per linear yard, it is then passed through the last set of rolls and finished on a single heat, with satisfactory results. But if the rail is of the heavier class, ranging in weight from 80 to 120 pounds per linear yard, its tendency to retain heat longer, and, therefore, be passed through the finishing rolls at a temperature too high to give good results, is overcome by allowing it to remain upon a cooling table for an interval of time ranging from 45 to 90 seconds, and it is then passed through the finishing rolls at a lower temperature, thus giving a rail of a much better quality of metal, especially in the head of the rail. The rail is now sawed into the desired lengths, usually of 30 feet, and then passed through the cambering rolls, where it receives sufficient camber to prevent warping when it is being cooled. After being cooled off on the hot beds it is straightened, chipped and filed and is then ready for shipment as a finished product. Improved apparatus has in recent years greatly facilitated the operations in rolling rails. Electricity has been a prime factor in their operations.

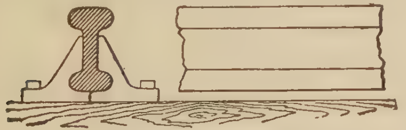

FIG. 5.— Double-headed rail.

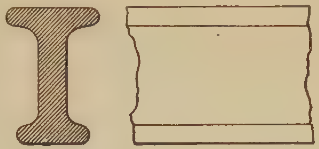

FIG. 6.—Bull-headed rail.

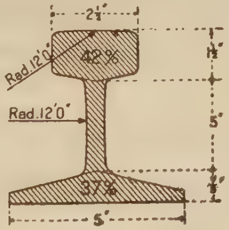

FIG. 7.—Flanged T section rail—80 lbs. per linear yard. Standard Am. Soc. Civil Engineers.

In the manufacture of «structural» shapes (a term which includes a great variety of angle-irons, T-irons, I-beams, Z-bars, eye-bars, channel-irons and built-up posts, beams and girders), used in the construction of modern buildings and bridges, the shapes are rolled from basic open-hearth steel of three grades — the rivet steel with an ultimate strength ranging from 48,000 to 58,000 pounds; the soft steel from 52,000 to 62,000 pounds; and the medium steel from 60,000 to 70,000 pounds. The elastic limit generally required is not less than one-half of the ultimate strength, and the test pieces are required to be capable of being bent over through an angle of 180 degrees, without fracture. The raw materials, consisting of ore and pig-iron, are melted down in the cupolas and are then run into the open-hearth tilting furnace, where an equal amount of cold scrap, in the form of steel junk, crop-ends, punchings, etc., from the construction shops, is added. The contents of this furnace, sometimes amounting to 75 tons, are poured into a hydraulic ladle crane, which is then swung over the casting pit, and the molten metal poured into the ingot molds in the usual way through the bottom of the ladle. The ingots when set are reheated in the soaking pit and then passed through the blooming mill and reduced to blooms and billets of any required size. They are then rolled to the desired shapes, sawed into the required lengths and then cooled on the hot beds. From the hot beds they are passed through the straightening rolls, and after being cut into exact lengths, as required, they are ready for the construction shop.

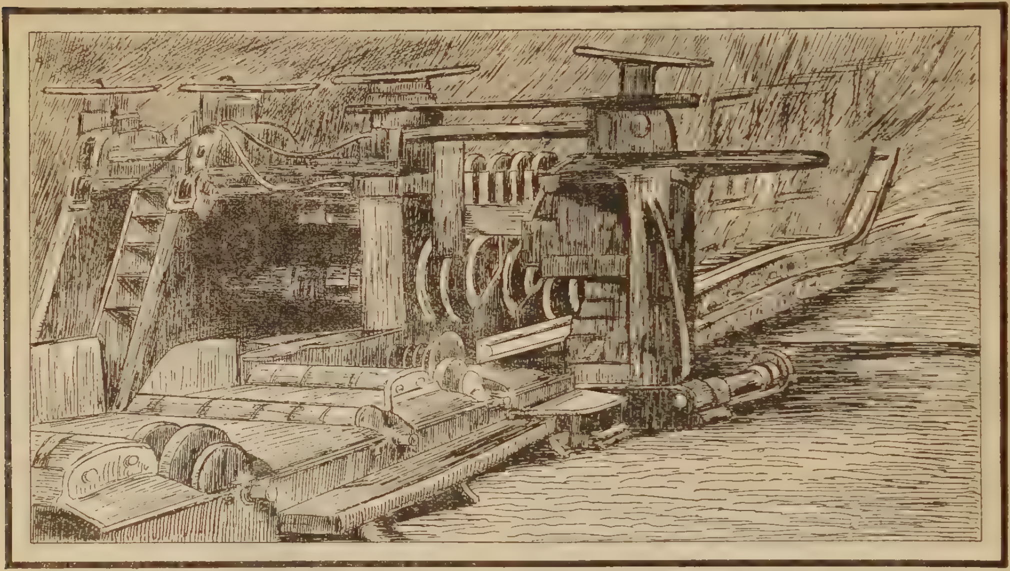

Fig. 8.— Rail passing through the intermediate rolls in the rail mill.

In the production of finished bridge members, the shapes are carefully laid out by wooden templates, in which the precise positions of rivets, angles, gussets, etc., are marked. The operation of building up requires great care and accuracy. The shapes are sawed or sheared to exact length and the sides and ends faced and planed down as required by the drawings. The small holes for bolts and rivets are punched by lighter forms of machinery driven by electric power; on the other hand, all pin-holes are first punched and then bored to exact diameter. In assembling, the rivet holes are properly registered, being reamed if necessary, and the separate parts bolted together and finally riveted up by hydraulic or pneumatic riveters. See Metal-working Machinery.

In the manufacture of eye-bars, used in bridge construction, the tensile strength is limited to not more than 10,000 pounds below the test specimen of the grade of steel from which they are rolled. The eye-bar heads are formed by upsetting machines operated by hydraulic power, in which the heated end of the eye-bar is pressed to the desired circular form by the three-fold die of a hydraulic press, in a single operation. The head is then forged and punched at one heat, and then finished bored. Eye-bars are tested in a hydraulic testing machine capable of exerting a maximum pull of 700 tons. When an order of eye-bars is completed, one of the bars is pulled asunder in the machine. In general, they are required to show not less than 10 per cent elongation in the body of the bar and they must break in the body and not in the eye. See Building in the United States; Electrochemical Industries; Iron; Iron, Manufacture of; Iron Founding, Chemistry of; Iron and Steel Industry in the United States; Iron Ores; Iron Skeleton Construction; Iron and Steel, Metallography of.

**RAILWAY ASSOCIATIONS, LABOR.** See Railway Labor Organizations.

**RAILWAY BRIDGE DESIGNS.** See Bridge Designs, Railway.

**RAILWAY BROTHERHOODS.** See Railway Labor Organizations.

**RAILWAY CARS. Passenger and Freight.**— Passenger cars on the earlist railways usually had small bodies of the stagecoach type mounted on four-wheel frames. In 1833, however, cars long enough to seat 60 passengers and having the body carried by a pair of four-wheeled swiveling trucks were designed and built by Ross Winans for the Baltimore and Ohio Railroad. Cars approximating the present American type were in use as early as 1835. Distinctive features of this type are the long body mounted on four-wheel or six-wheel trucks and having cross-seats on both sides of a central aisle which, with end doors and platforms, permits of passage through the train. A modified design has pairs of fixed chairs in place of the usual double seats. As the chair backs may be lowered for reclining more space is required and a 70-foot car may have seats for 84 or chairs for 64 passengers. Vestibules enclosing the car platforms and connected by flexible diaphragms were introduced in 1886, but similar connections between mail cars had been used since 1852. They add to the safety and convenience of passengers and decrease danger in collision since they make the train practically one long articulated car.

A long-distance train may have day cars (often called coaches), mail, express and baggage cars, parlor or sleeping cars, a dining car and perhaps an observation car with library and writing desks, while bathrooms and barber and stenographer service are sometimes included. American railways are noted for going rather to extremes in providing comforts and conveniences for passengers, although this greatly increases the weight of car in proportion to the passengers carried. The American type of car is extensively used abroad, except in Europe where the existence of from two to four classes of passengers makes its application difficult.

European railways have always used cars of the compartment type, with transverse partitions and side doors. Each compartment has two opposite seats, so that half the passengers must ride backward The cars are in general smaller and lighter than those of American railways and many have only four to six wheels, but of late years the size and weight have been increased. Trucks which are called «bogies» were introduced on English cars in 1872. Corridor cars, an innovation of about 1883, have a narrow passage along one side, with side doors to the compartments and end doors to vestibules between the cars. A 43-foot 18-ton compartment car will seat 70 third-class passengers in seven compartments, or a 50-foot car may seat 80, while a 54-foot 23-ton car may carry 18 first-class and 40 third-class passengers. A 50-foot corridor car, however, may seat only 36. Special suburban cars for workmen carry 120 passengers in 10 compartments.

Car equipment of American railways amounted to 1,216,000 cars of all kinds in 1891 and 2,600,000 in 1916. Of the latter, 56,000 were for passenger trains, 2,400,000 for freight trains and 100,000 for railway service. Passenger equipment included 40,000 day cars, 1,380 dining, 660 parlor, 750 sleeping, 1,600 mail and 10,000 baggage and express cars. These are exclusive of the Pullman Company's 7,750 sleeping, parlor, tourist, dining and observation cars. Private cars, officer's cars and hospital cars are special equipment. Cars having their own motive power — steam or gasoline — are used sometimes on lines of light traffic. Freight cars included 1,050,000 box cars, 150,000 flat and gondola, 920,000 coal, 53,000 refrigerator, 88,000 stock and 10,000 tank cars, besides 95,000 caboose cars for the train crews.

Modern day cars 68 to 78 feet long over platforms seat from 60 to 90 passengers and weigh from 50 to 72 tons. A steel mail car was put in service in 1889 and a few experimental cars were built later, but in 1907 the Pennsylvania Railroad adopted steel construction for all its passenger cars. Other railroads followed and in 1908 there were 1,228 steel cars, 75 per cent of which were for suburban or rapid-transit service. In 1916 about 22 per cent of the passenger equipment was of steel, exclusive of cars having steel underframes and wood bodies. Steel 80-foot day cars for 88 passengers weigh about 56 tons; 76-foot mail car, 64 tons; 72-foot dining car, 70 tons; 80½-foot sleeping car, 65 tons; and 64½-foot suburban car for 72 passengers, 37 tons. While heavier than wooden cars they have advantages in safety, durability, maintenance and repair.

Sleeping cars were run between Philadelphia and Harrisburg on the Cumberland Valley Railroad in 1836. These had three tiers of fixed berths on one side. In 1856 T. L. Woodruff built and patented a sleeping car embodying some features of the present type. A similar design was patented by Webster Wagner in 1857. The more successful work of George M. Pullman began in 1859 when he converted two 42-foot day cars into 10-section sleeping cars for the Chicago and Alton Railroad. These were the first made with folding berths. His first car of the present type was built in 1864. The Mann car, with separate compartments opening from a side corridor, was put in service in Europe in 1873 and in the United States in 1883. The Pullman Company was organized in 1867 and eventually acquired control of competing concerns. Its standard car has at night two double rows of longitudinal berths shut off from the central aisle by curtains. While strength and appearance have been improved, the cars still have primitive arrangements for dressing and toilet facilities. Compartment sleeping cars, which are used only to a limited extent, have greater privacy and convenience but carry fewer passengers. It is this type which is mainly employed in Europe, generally with berths across the car and sometimes without upper berths. For long runs, Pullman in 1867 introduced the hotel car, which was a sleeping car provided with a kitchen, meals being served on portable tables fitted between the seats. This was soon superseded by the separate dining car.

Freight cars have been developed to great size and capacity by American railways owing to the long distances, the large amount of bulk freight such as coal and ore and the economy of large loads, since car weight per ton of load decreases as the load increases. Thus large cars and long trains are among the factors in the marked economy of railway freight transportation in the United States. The 10 and 15-ton car capacity of 1875 increased to 20 or 25 tons by 1885, when 30-ton cars also were being used. Few cars of less than 30 tons capacity are now in use; 40 and 50-ton cars are common and there are numbers of 60 to 100-ton cars.

The maximum is reached in 120-ton steel coal cars on two or three railways. These are 50 feet long, have six-wheel trucks and weigh 37 tons. Other railways have 48-foot coal cars of 85 tons capacity weighing 30 tons. Steel construction for open cars and steel underframes for other types of freight cars are used very extensively. A 40-foot box car of 50 tons carrying capacity will weigh about 24 tons; 45-ton refrigerator car, 30 tons; 100-ton gondola, 30 tons. Refrigerator cars for meat, fish, fruit, etc., have thick walls, roof and floor, insulated by air spaces and packing and are fitted with ice chests. Similar cars, without ice, serve in winter to protect perishable freight, being sometimes warmed by a small stove beneath the floor.

Special classes of freight cars include coke, coal, dump, flat, horse, stock, ore, poultry, refrigerator and tank cars. The ordinary length of car is 30 to 42 feet. Long cars with three trucks have been built; also steel-frame cars with four or more trucks for carrying guns or very large and heavy castings.

European freight cars are in general much smaller and lighter than those of American railroads. Four-wheel cars 10 to 15 feet long, of 8 to 10 tons carrying capacity and 6 to 8 tons weight, form the bulk of the equipment. There are six-wheeled cars of somewhat greater size and up to 20 tons capacity; also some 30 to 40-ton cars on four-wheel trucks. Closed or box cars are used less than in America, freight in open cars being protected by tarpaulin covers furnished by the railways. These small cars are suitable and economical for the system of prompt handling of small shipments which is characteristic of European — and particularly English — railway service. They are not economical for coal and other bulk freight, but though larger cars have been introduced the use of varying lengths of cars causes complications at terminals, coal docks and mines. The American types of long freight cars on trucks are used extensively in India, South America, Australia and Africa; also in Europe, outside of England.

Cast-iron wheels are a feature of American cars and long experience in manufacture has led to the production of a grade of metal peculiarly adapted to this service. Steel and steel-tired wheels are used extensively, especially under passenger cars. For noiselessness, compressed paper centres in steel tires have been tried. Wood-centre wheels for passenger cars and wrought-iron wheels for freight cars are used in England and are generally larger than the 33-inch or 36-inch wheels common in American cars.

Automatic couplers for cars are used universally in the United States. For the old link-and-pin coupler the drawbar of each car had an enlarged hollow head to receive one end of a straight link, which was secured by a pin dropped through a hole in the drawbar head. Removal of the pin released the coupling. Owing to the deaths and injuries resulting from coupling and uncoupling by hand, a campaign for compulsory use of automatic or safey couplers was started by L. S. Coffin, resulting in the passage of a law by Congress, in February 1893, providing that by 1898 all freight cars must be equipped with automatic couplers that would couple by impact and would not require men to go between the cars. The time was later extended and the application of these and other safety appliances was put under the jurisdiction of the Interstate Commerce Commission.

Automatic couplers had been the source of innumerable patents and extensive trial, but the difficulty was to have all railways adopt and introduce one universal type. Designs patented by Eli H. Janney in 1873 and 1874 were modified in 1879 to the general contours of the present coupler heads. At first this was for passenger cars but later it was adapted to freight cars. In 1884 the Master Car Builders' Association adopted the principle that the coupling faces should be in a vertical plane, or free to move vertically. In 1887 it adopted the Janney type as standard in order to arrive at some uniformity. The inventor broad-mindedly relinquished his claims to monopoly on the contours of the coupler heads, so that any manufacturers could make couplers of this standard type but with their own details as to drawbars, springs, etc. Much has been done to simplify and standardize the designs in order to eliminate the varying details.

In the Janney or M.C.B. coupler each drawbar has a deep claw-shaped head, to the claw of which is pivoted an L-shaped knuckle. When two cars are pushed together the knuckles interlock. To uncouple, a vertical locking pin is withdrawn from one coupler, the knuckle being able then to swing open and release the other when the cars are pulled apart. The lock is attached to a chain on a rod operated from the side of the car. Passenger cars now have this same coupling, but at one time there was extensive use of an automatic coupler invented by Ezra Miller in 1867. The drawbar had a fish-hook end, with inclined face; when two cars were pushed together these contact faces forced the drawbars sideways until the hooks interlocked. To uncouple, one drawbar was pulled sideways by a lever on the car platform.

Foreign railways make general use of coupling chains attached to hook-end drawbars, the free end of the chain on one car being hooked over the drawbar of the other car. The chain may be drawn tight by a right and left hand screw until spring buffers on the ends of the cars are in contact, but on freight trains the chains are often left loose. Automatic couplings have been tried but have not come into use, except a combined hook coupling and central buffer applied to narrow-gauge cars. This differs from the American type in that the coupling faces are horizontal and narrow, the hook in one coupling riding up to engage a slot in the other.

**Railroad Car Lighting and Heating.**— For lighting passenger cars, electricity and compressed oil gas have superseded oil lamps. Other illuminants tried are coal gas, acetylene gas and air saturated with gasoline vapor. Electric lighting is applied generally by equipping each car with a generator driven from one of the axles by a belt, storage batteries being used to maintain the light when the train is at rest or moving at slow speed. Another system is to supply the entire train from one generating plant placed in the baggage car and driven by a steam engine, though it may also be driven from a car axle. This system is more applicable for trains made up of the same cars for long distances.

Electric light for railway cars was introduced first in 1881 by the London, Brighton and South Coast Railway, of England, using cars equipped with storage batteries. The time (several hours) and inconvenience of charging the batteries led — in 1883 — to the addition of a dynamo driven from the car axle. The battery system was first used in the United States in 1882 by the Pennsylvania Railroad, which applied it extensively. This was followed by other railways, but the system was abandoned in a few years owing to the time required for charging the batteries, the cost of equipment for brilliant lighting and the cost of maintenance due to the short life of the batteries. As the batteries for one car weighed about a ton, to change them would have been about as much trouble as to charge them.

Direct-dynamo lighting, with a generating plant to serve the entire train was introduced in 1882 on the Paris, Lyons and Mediterranean Railway, and in 1889 on the Chicago, Milwaukee and Saint Paul Railway. This was supplemented later by batteries, either on each car or on the car with the plant, in which latter case some auxiliary light had to be supplied for use when the cars were separated.

Car heating on American railways is effected almost universally by piping steam from the locomotive to coils and radiators, the cars being connected by flexible hose. Coal stoves caused so many disasters that their use has been prohibited. A special heater for sleeping and dining cars which may have to be separated from trains consists of a small and well protected stove with boiler connected to the heater pipes. At large terminals the tracks on which passenger cars are stored are equipped with steam pipes with flexible connections for the car-heating systems. In Europe this system is used less extensively. In England the main reliance is upon portable «foot warmers» filled with hot water or with acetate of soda, which latter retains heat for a period of several hours. For railroad car braking see AIR BRAKE; for construction and repair machinery see RAILWAY SHOPS AND MACHINERY.

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**RAILWAY CONSOLIDATION.** The consolidation — or as the English say, the amalgamation — of railways consists either (*a*) in uniting connecting lines into one continuous line, or (*b*) in uniting parallel or competing lines into a system. Railways in the United States were originally built for the most part in short, disassociated lines — little stretches of road from A town to B town. Construction had progressed only a little before the desirability of connection between these lines became obvious. And almost at once such connection began to be arranged, so that, in the progress of our railway building and some time prior to about 1870, a great number of these little lines in every part of the country had been amalgamated, with the result of developing our great trunk line systems. Before we had entered upon the last quarter of the 19th century, it had come to pass, speaking generally, as a result of this tendency to unite connecting lines, that very much the greater and more important part of our railway system consisted of long lines of road under a single management or control, made up, especially in the older parts of the country, of a less or greater number of formerly disconnected and independent local lines, which had been one after the other taken over and incorporated into the greater continuous line or system. Almost all the valuable and well located local lines had, 30 years or more ago, thus been absorbed into larger and less local combinations. Such consolidation, working only benefit to the public and demonstrating its usefulness as it went along, provoked only a small amount of opposition, and these amalgamations of connecting lines usually secured legal sanction, whenever necessary, without the protest of the politicians. But about 1870 — now (1917) about a half century ago — a tendency in the direction of the consolidation of parallel and competing lines developed. What had long been known in Europe to be the true law of railway construction and the sound basis upon which railways must ultimately come to exist and be operated in every country where there is enough wealth and commercial activity to make them successful — namely a division of territory and the practical elimination of competition between parallel lines in the same territory — began to assert itself and to be felt to be applicable here: and directly we entered upon a period of consolidation, not now of connecting but of competing lines; and, summing up the whole matter in a single sentence, that process of amalgamation, having now gone on in this country for nearly 50 years, it results that we are now at the end, substantially, of the second stage of railway combination.

First, we built isolated and disconnected local lines; second, we united these connecting lines — whenever they did connect — into continuous lines; and third, we divided up the territory between theretofore competing lines, by gradually amalgamating either the ownership or the control of such lines in a defined territory, thus securing little by little to a single interest, a territorial monopoly of the carrying services of the locality. This process carried out to its logical conclusion roughly divides the whole country into railway territories of greater or less extent, within each of which one single railway system is paramount or absolutely controlling. This readjustment of ownership and control between the greater railway companies of the country goes steadily on. In some sections of the country it seems to have been fully and finally accomplished; in other sections it is in progress; and only where the game isn't worth the candle or where the work has been done, is there an absence of activity in this direction, the tendency so to consolidate, first connecting and then competing lines, has been universal and inevitable, and such consolidation is in the one case an accomplished fact and in the other an irresistible evolution. Very little effort was made to prevent the earlier consolidations, that of merely connecting lines. It is now well understood that such efforts, if they had been made, would have failed, and it is now not questioned that such consolidations have been beneficial both to the public and the railways. On the other hand a very great deal of effort has been made by courts and statutes to prevent and hinder the second form of consolidation, that of competing or parallel lines. These efforts have also for the most part failed, and it is now coming more and more to be believed that they will ultimately wholly fail to prevent what seems to be the inevitable in railway development. Moreover in the case of the amalgamation of connecting lines, the mischiefs which have been apprehended have generally not been realized; so that now not only most practical railway men, but many students of the railway problem believe that in the outcome the balance of benefit both to the carrier and to the public will be also found on the side of territorial division between competing lines. The emphasis of our intelligent thinking and our most efficient effort is now put rather on regulation than repression.

The history of railway construction and combination throughout the world seems to indicate *first*, that the consolidation of competing lines is inevitable; *second*, that efforts by legislation or litigation to prevent it always fail; and *third*, that such consolidations benefit both the public and the railways. The facts and figures concerning these consolidations in the United States are detailed elsewhere in this work, but the economic questions involved are still open ones with us. Elsewhere throughout the world these questions seem to be settled. Thus in England, where the railway problem has in many of its features been strikingly like our own, the question is now quite at rest. In France the question never really arose, and elsewhere in Europe it has been decided everywhere in favor of amalgamation and against the continuation of competition between lines serving the same territory. (The writer's argument in the Supreme Court of the United States, October Term, 1903, upon the appeal of The Northern Securities Company *et al.* v. the United States).

**England.**— In February 1872 a Select Joint Committee on Railway Companies' Amalgamation was appointed by the two houses of the English Parliament to investigate and report back the condition of the railways of Great Britain, particularly in respect of the consolidation of lines and the division of territory among the greater companies. Mr. Chichester Fortescue, in moving the appointment of the Select Committee in the House of Commons, on 23 Feb. 1872, said that «20 years ago a committee had reported against the system of amalgamation, but since that committee reported amalgamation had gone on as merrily as before — the fact being that 5,000 miles of railway had been added to the greater railways since that time.»

This committee called a great number of witnesses and went fully into the details of the matter throughout the British Islands, and on 2 Aug. 1872, presented a voluminous report, from which it appeared that by the end of the year 1843, 71 separate and independent lines had been constructed, averaging about 30 miles each in length. During the following year the average mileage per independent line was reduced one-half, so that by the end of the year 1844 the average was only about 15 miles. Between 1844 and 1847, 637 separate companies had been chartered, with a total authorized length of about 9,400 miles of line. Eleven proposals, for example, were made to Parliament for lines of railway through a single narrow valley, where but one line was possible. This called so loudly for relief that consolidation began about 1847, and so proceeded, by the gradual absorption of the smaller lines by the larger systems, and by a consequent division of territory between the consolidated companies, that by 1872 it had come to pass that the railway business of the kingdom was substantially performed by no more than about six of these great amalgamated companies. The first English railway charters contained provisions intended to prevent competition both between the lines themselves and between them and the canals, especially in freight traffic. George Stephenson, the father of English railways, seems to have appreciated clearly the mischief to be avoided in the matter of competition, even at that early day, and he, therefore, set himself to the task of getting the railway system in that country started right in this particular. His view on this subject was summed up in his much-quoted saying that «where combination is possible, competition is impossible.»

In 1836, a Mr. Morrison, M.P. from Inverness, made a remarkable speech in Parliament, in the course of a discussion of the then English railway situation, in which he pointed out with uttermost clearness that a railway must in the nature of things be a monopoly; that competing roads will inevitably combine; that parallel lines are sheer waste of capital and that fixed maximum rates are useless. This utterance is the more remarkable because it stated clearly at the outset of railway building and before there was any basis of fact and experience upon which to found such generalization, the ultimate principles which long experience has since demonstrated to be sound.

Thus it is seen that the English railways started right but that they soon got wrong, and for the first 30 years and more, blunders in plenty were made in futile endeavors to construct and operate railways on the principle of inter-competition. Uncounted treasure was wasted in these attempts, and absolutely nothing but experience was gained by it. By 1872 competition had been substantially eliminated through the operation of natural laws and in spite of hostile legislation and litigation. It was said in Parliament, in the debates over the appointment of the Select Committee in 1872, that there was not at that time a single competitive rate existing in the kingdom. With the legislation of 1873 the general railway situation in England was fixed and determined, and the agitation for competition ended. The railways ceased to be bugbears, and fears of mischief to the public from the growth of railway influence and power gave place to intelligent criticism of railway methods and to a public-spirited determination to get good service at fair rates while giving the companies a free hand to manage their finances in their own way. Thus, after nearly 40 years of experiment, agitation and disturbances, the English people came back about 1872 to their point of commencement. Mr. Adams, in his 'Railroads and Railroad Questions,' says that then England «settled down on the doctrine of *laissez faire*»; and President Hadley, in his 'Railroad Transportation,' says: «It might better be said that it has settled down on the policy of specific laws for specific troubles.» By about 1872, as we thus see, the problem was solved by the operation of immutable economic laws, and the decision against competition between lines made beyond all possibility of reversion. To make a summary statement it appears that in 1847 there were about 5,000 miles of railway in England, owned and operated by several hundred independent and competing companies; 25 years later there were 13,000 miles of railway, owned and operated by 12 partly competing companies; in 1917 there were about 24,000 miles, owned and operated by about six non-competing companies.

The history of some of the greater English companies taken a little in detail illustrates the situation. The London and North-Western Railway was first opened for traffic in 1837, about a month after the accession of Queen Victoria. In 1846 it consisted of a main line from London to Birmingham, with some insignificant branches. In 1852 a writer on the position of the company complains that it «fell a few years back into the error generally committed by railway companies of amalgamation with numerous other railway companies. From being a line from London to Birmingham, 112½ miles, it has become a line or lines of 539½ mile long — five times its original length.» Since that time it has increased its mileage nearly fourfold, and has merged into its system the Chester and Holyhead lines on the west and the Lancashire and Carlisle on the north, besides numerous smaller undertakings too numerous to mention. The Great Western Railway has been absorbing smaller independent lines in its territory for many years, and altogether considerably more than 100 have been so absorbed within the last 40 years. Since 1896 it has taken over about 20 such lines, adding thereby 260 miles to its system. Of its total capital expenditure from 1892 to 1901, amounting to about £15,500,000, nearly £5,000,000 represented amalgamations. The North-Eastern Railway is a consolidation of various small lines which has resulted in a vast network of railway in the northeast of England without a single intruder in the territory in the shape of a competitor. The report of the Select Committee on Railway Amalgamation in 1872 contained the following reference to this line:

> The case of the North-Eastern is a striking illustration. That railway or system of railways is composed of 37 lines, several of which formerly competed with each other. Before their amalgamation they had, generally speaking, high rates and fares, and low dividends. The system is now the most complete monopoly in the United Kingdom; from the Tyne to the Humber with one local exception, it has the county to itself, and it has the lowest fares, and the highest dividend of any large English railway. It has had little or no litigation with other companies. While complaints have been heard from Lancashire and Yorkshire, where there are so-called competing lines, no witness has appeared to complain of the North-Eastern; and the general feeling in the district it serves appears favorable to its management.

The Great Central Railway, which was opened for all classes of traffic in April 1899, has a total mileage of 665 miles. Of this mileage 465 belongs to it and 200 are jointly owned with other companies. In addition the company owns 111 miles of canals and tramways. It is, therefore, a system essentially made up of joint lines and canals. It is also the newest line in England and may stand for the most recent type of development in that country.

Working along essentially parallel lines all intramural transit in London which is wholly or partly underground, aggregating nearly 225 miles in length, has been in effect consolidated into two great substantially non-competing enterprises, dividing the territory in a way between them, upon a line (roughly speaking) which runs northwest and southeast through Piccadilly Circus, or dividing, along non-competitive lines as much as possible, about Piccadilly Circus and converging severally therein. The Joint Parliamentary Committee of 1901 reported that it was desirable that the working of underground railways in and around London should be put under the control of some one consolidated interest; and that has been the ultimate solution.

The English courts commenced, about the middle of the last century, to break down the old common-law doctrines theretofore in vogue against monopolies, which were invoked in opposition to railway consolidation. Gradually the whole legal theory upon which those doctrines were attempted to be sustained has been overthrown, until now there is in England no legal objection possible to be urged, and very little popular prejudice to the amalgamation of railway lines whenever and wherever it seems to be economically desirable. The legal arguments against these consolidations were always drawn from the old decisions against monopolies and restraint of trade, which more than 50 years ago began to be repudiated *in toto* by the English judges. Thus in a leading case often referred to, which was decided in the House of Lords about 1850, Lord St. Leonards used the following notable language:

> My Lords, there are just a few remarks that I wish to make upon public policy. I will not add a word to what has been already said by my noble and learned friends, but I will call your attention to what fell from one of the learned judges (Mr. Justice Cresswell) as regards the restraint of trade. That learned judge says that with regard to the restraint of trade, there is a maxim in common law, and he refers to a case in Year Books (2 Hen. V., pl. 26), to prove it; but the learned judge did not tell your lordships upon what that maxim was founded. Nobody supposes that there was any statute upon the subject in those times. Upon what, then, was that maxim founded? Why, upon public policy for the good of the realm. It was not good for the realm that men should be prevented from exercising their trades. Now, let us see what this particular case is; it lies in few words and remarkable consequences have resulted from it. It was an obligation with a condition that if a man did not exercise his craft of a dyer, within a certain town, that is, where he carried on his business, for six months, then the obligation was to be void, and it was averred that he had used his art there within the time limited, upon which Mr. Justice Hull, being uncommonly angry at such a violation of all law, said, according to the book, " Per Dieu, if he were here, to prison he should go until he made fine to the king, because he had dared to restrain the liberty of the subject." I wish to draw your lordships' attention to this case. Angry as the learned judge was at that infraction of the law, what has been the result of that very rule without any statute intervening? That the common law, as it is called, has adapted itself, upon grounds of public policy, to a totally different and limited rule that would guide us at this day, and the condition which was then so strongly denounced is just as good a condition now as any that was ever inserted in a contract, because a partial restraint, created in that way, with a particular object, is now perfectly legal. Without any exclamation of the judge, and without any danger of prison, any subject of this realm may sue upon such a condition as Mr. Justice Hull was so very indignant at in that particular case. That shows, therefore, that the rule which the learned judge, whose opinion is now before the House, thought depended upon some rule of common law, regardless of policy, was founded upon public policy, and has been restrained and limited and qualified up to this very hour, and beneficially so, by that very policy which it is supposed had no bearing at all upon the foundation of the rule. (*Egerton v. Earl Brownlow*, 4 H. L. Cas., 1, 237, 238.)

It is now about 20 years ago that the notable consolidation of the London, Chatham and Dover and the London and South-Eastern lines was effected, which operated to merge two theretofore independent parallel and competing lines and to allot the whole southeastern section of England to the amalgamated company. This, as is usual in that country, was accomplished through special Parliamentary powers, which in this case were sought and obtained without arousing any great opposition, engendering any considerable heat, or provoking any declamation about a sacrifice of the rights of the public. In point of fact, nothing but good seems to have flowed from it.

Previous to 1899 both these railways had achieved an unenviable notoriety for the inadequacy, slowness and unpunctuality of their services, for the dilapidated condition of their stations and rolling stock, and generally for the backward state of their accommodation. In the case of the Chatham Company the financial position was also precarious, and though the South-Eastern at one time was nominally much stronger in this respect, it too had lost much ground in the preceding five years, and for 1901 its ordinary dividend at the rate of only 2 per cent was the worst in its history. Competition of the worst kind between the South-Eastern and Chatham companies was a normal state of affairs, and as the result both railways spent vast sums of capital and revenue for which there is at the present time little to show except duplicate lines and stations, and inadequate provision for traffic where extended accommodation was most required. Many times a fusion of interests had been urged upon the two companies, but without result. Negotiations for amalgamation were entered upon several times, but they always broke down at the crucial moment.

At last, in 1898, an agreement between the two companies was reached, not for a complete amalgamation, but for the pooling of gross revenue and working expenses and the division of net profits on a fixed percentage basis, with additional arrangements for the joint contribution of capital required. It was not the intention of the two companies to seek Parliamentary authority for this arrangement, as they were not bound to secure the sanction of any other body than their shareholders. But the government virtually intimated that the new arrangement was so important and far-reaching in its bearing on the interests of the public, that the terms of agreement ought to be embodied in a bill. This bill received the royal assent on 1 Aug. 1899, and seven months thereafter the new arrangement came into operation.

The preamble of the bill recites that

> With a view to avoiding undue competition and unnecessary expense and delays and other inconveniences arising from diversity of interests and to turning to the best account the respective powers and resources of the two companies . . . it is expedient and will be for the public advantage that, subject to the provisions and enactments in this Act contained, the undertakings of the two companies should be used, worked, managed, maintained, and improved from and after the passing of this Act, as one undertaking. . . . .

The Act constituted a Managing Committee to administer the two railways as one company, that new body being made up of the directors of the two companies.

The committee of 1872 sum up their view upon the effect of hostile or prohibitory legislation on this subject as follows: «A long and varied experience has fully demonstrated the fact that, while Parliament may hinder and thwart it, it cannot prevent it.» The theory of the British Constitution is that Parliament is omnipotent, and here there is formal admission that there are things that omnipotence cannot do.

**France.**— The French railway system was developed a little later than the English, but we must look as far back as the reign of Louis XI, in the latter part of the 15th century, if we are fully to understand and appreciate that development. That sagacious and masterful prince, who reigned from 1461 to 1483, broke effectually the power of the great feudatories, and by a consolidation of authority in the Crown laid the foundation of the absolute monarchy. His taking the postal service out of the hands of the feudal authorities and away from the cities and making it a matter of national administration, these 400 years ago and more, was one of the most notable acts of his reign, and was in a way the first step toward the modern railway system of France. «Modern history,» says President Hadley, in speaking of the nationalization of the French post office, «— the history of nations as such — may almost be said to have begun at this point.» What Louis XI did for the power of the Crown and for the postal service of the country, Louis XIV and Colbert did in laying the foundation of the national system of highroads and canals. The Ecole des Ponts et Chaussés was founded, and trained engineers graduated therefrom laid out, constructed and perfected that splendid system of canals and highways, radiating from Paris and reaching every corner of the kingdom, which long ago made France the first country in the world in its roads and waterways. There was from the beginning complete organization, intelligent survey and construction and strict supervision; so that an almost perfect system of lines of communication existed in France before railways were known. In no other country had such results been accomplished in road-making, and nowhere else was such completeness of organization and development possible. The genius of highways had in some sort come down to France as an inheritance from Rome, whose military roads were one of her most characteristic monuments. In this state of case, with a perfect system of roads and canals already built and in operation — which made railways seem less necessary in France than in other countries — it is not strange that the French built railways slowly and cautiously. So it was not merely accidental that France moved tardily in this matter. It is not in the French character to make radical changes, or to do things piecemeal; and it was easy for her highway engineers to see that other nations were blundering in their first railway construction. The racial qualities that distinguished the French, their spirit of order and economy, their notion of proportion and their conservative good sense in business, all had something to do with their making haste slowly in railway building. It is very much the French way to let other people make the initial experiments in new things, and only to take a thing up when it is demonstrably sound and feasible. It is almost a racial instinct, and this is what happened in the development of French railways. The result is that they now possess the only railway system in the world which was intelligently conceived from the outset as a unit, which was scientifically planned and laid down by competent engineers working together to a common end, and which was built as a whole. The conditions in France that made this possible had their genesis in the dominating sagacity and spirit of order of Louis XI. The highways and canals led up to the railway lines, and the governmental regulation and control of the old land waterways grew naturally into the present system of railway supervision. The system of roads and waterways existing in 1830 suited the French nation exactly. They were so arranged and classified that each bore its exact proportion of importance, whether national, departmental or local. They were regulated from Paris with ease and with military precision. Never was there so efficient a corps of engineers for carrying out such a scheme as that which is trained at the École des Ponts et Chaussées. The first step taken by the government looking to a general railway system was the appropriation of a sum of money to pay the government engineers for laying out a general system of railway lines covering the whole of France. When this survey was completed, and while the lines existed only on the maps and blue-prints of the engineers, the government next took up the question of ownership and management. While other countries had been acting and experimenting and making costly mistakes, France had been reasoning and thinking the matter out. There was a long series of debates in Parliament between 1837 and 1840. The plan finally adopted was the conception of Thiers, and was settled upon in 1842. The plans then and thus deliberately conceived and matured — both of engineering and of legislation — have since been carried out consistently. They were sufficiently elastic to be practicable. It was at the outset a policy of support and control without actual ownership, or, in other words, a policy of subsidies to encourage private companies, and in return for these subsidies a reservation of more or less important rights of state control. As the work proceeded and as new conditions arose, amendments and modifications were incorporated into the plan as originally conceived. In 1842 it was strictly a plan for subsidies; in 1852, extensions of chartered privileges were granted to the companies; in 1859, a scheme for the guarantee of interest on the bonds was inaugurated, and, in 1883, the government guarantee was extended to dividends.

Under the plan adopted 33 different companies were chartered, contemplating about 2,500 miles of line. Building went on rapidly until the Revolution of 1848, and then again after the accession of Napoleon III in 1851. The lines have from the beginning been laid down with the idea of avoiding all duplication and all waste of capital; they were surveyed and traced by government engineers, and each part stood in its proper and intelligent relation to the whole. Parallel lines were forbidden as a matter of course, and competition was not conceived of as among the possibilities of the situation. By 1852 the number of independent systems had been reduced from 33 to 11, and in 1859 the 11 were reduced to six, of which five radiated from Paris. Each had a monopoly in its own territory. Competition running riot, the construction of needless lines as a mere speculation in the securities, rate wars, with their attendant iniquities, and the consequent wanton waste of money and effort in construction and operation are essentially unthinkable to a French railway engineer or official New construction is undertaken only as required, and to meet the necessities for more lines growing out of the development of any particular territory. About 1859 it became obvious that a considerable amount of new construction was necessary in order to bring the railway system up to a proper standard of utility and efficiency, and in order to secure this construction, each of the six companies, and each in its own district, undertook to construct a large number of branch lines. The government took the initiative, and in order to facilitate this new work and to secure it promptly recourse was had to a system of state guarantees of interest on the bonds upon which the money for the new construction was to be raised. This was the plan devised by De Franqueville. Money was, of course, easily raised by issues of bonds upon which the government guaranteed 4 per cent, this guarantee making the securities instantly marketable and extremely valuable. There was, accordingly, no wasteful financiering, no iniquitous jobs, no lack of funds, no foreclosures, no reorganizations, receiverships or squeezing of investors. In 1865 a further plan was proposed in the Chamber for the construction of a network of local roads not to belong to the six companies, and the municipal authorities were given the right to subsidize such lines. Pursuant to this plan, several thousand miles of these local lines were built throughout the country within the next five years. It was not, however, contemplated that they should be combined into systems which might interfere in any way with the monopoly of the six companies. They were designed to be feeders. However, after the war of 1871, the prohibition to combine was successfully evaded, and these local lines by a series of combinations began to be serious competitors in many places to the main systems. This made it necessary for the government to take the matter again in hand, and the problem was ultimately solved by having the great companies take over the local lines within their territories severally, upon terms. In 1879, by a decree of July of that year in the Chamber of Deputies, De Freycinet undertook to raise a loan of 3,000,000,000 francs for the construction of about 10,000 miles of additional line. This plan has been slowly carried out since that time. There was at first some delay, but by the beginning of 1884 this last comprehensive scheme of railway development was settled upon, the leading points of which were these: first, that the state hereafter should confine its own railway operations to the small district in the southwest occupied by what is known as the state line; that isolated lines which the state owned in various parts of the country should be taken over by the one of the six great companies in whose territory it lay; second, that additional lines as needed should in future be constructed only by the companies in whose district they belong; third, that the state should guarantee each company a minimum dividend, and that when the amount available for dividends exceeded a certain percentage — the rate differing for each line — two-thirds of the excess should go to the state. The limit, however, was placed so high that this provision has been practically inoperative. Thus, for example, on the Northern line, the guarantee minimum dividend is 13.5 per cent, while the point beyond which the state shares the excess is 22.1 per cent. In the case of the Paris, Lyons and Mediterranean, the guarantee minimum is 11 per cent, the state sharing in anything beyond 15 per cent, and so on, with slightly lower percentages for the other companies.

All of the lines in France except the old state line in the southwest and the western line taken over by the state a few years ago to placate the Socialists, are owned and operated by private companies. They are *concédés* and become state property upon the expiration of the concessions. Meantime they are subject to a strict governmental supervision and control. The length open for traffic by the latest figures obtainable (1911) was 25,194 miles, which fully meets all the requirements of the country. Of this total mileage 5,559 miles are state railways. The original scheme was for the government to contribute about 250,000 francs per mile; and private enterprise to find about 200,000 francs per mile, thus dividing the expense and the ownership. The concessions generally were to fall in, first in about 40 and later on in 99 years. When this occurs — about the middle of the present century — the government will, it is claimed, become possessed of an asset in the shape of railway property sufficient in realizable value to pay off in full the national debt. In 1892 the French railways were conservatively valued at 16,000,000,000 francs. The original plans of construction and joint ownership were somewhat modified as time ran on. In the construction of the French lines there has been less waste of capital and better results for capital than elsewhere in the world. French railways have cost less and come to more than any others on earth. It need not be argued that the French scheme put in practice would inevitably reduce the cost of construction to a minimum and would secure the best results for the least money. Passing by the matter of the state guarantee of interest and dividends, it may be said that the net earnings of the five private companies have been upon an average far beyond anything accomplished elsewhere in the world in that respect from railway operation. Furthermore, in face of the strong position of the French railways as monopolies, the government notwithstanding exercises a sufficient control — one which is in many respects admirable and reasonable. The French plan, as is seen, forces the numerous independent companies to work in harmony with one another, while giving each of them an absolute monopoly in their own territory. It renders, therefore, the process of consolidation within that territory easy and inevitable. Whatever slight attempts have been made in the Chamber to check or prevent combination or monopoly have been promptly overruled as contrary to the general scheme. This was particularly the case in 1875, when Phillippart, a Belgium capitalist, undertook to consolidate the local lines as against the six companies; and even the state itself in the operation of its own lines in the southwest has never succeeded in breaking into the monopoly of the Orleans Company in that territory. While France prohibits effectively competition between her railway lines, she is constantly spending large sums in improving internal water communication; and private carriers using these waterways without paying any toll carry off more or less traffic from the railways, and are allowed to do so. To make a summary statement, we find the facts to be that in France the railway system was intelligently planned as a unit from the outset; that the lines were laid down by competent government engineers and constructed without paralleling; that in consequence very little money was wasted in construction; that competition did not enter into the scheme as originally devised, and that when it arose — notably through the consolidations of the network of local lines built between 1865 and 1870 — it was suppressed by the government; that railway investments have been almost uniformly profitable, and upon the whole much more profitable than in other countries; that freight rates are not excessive and that passenger rates are very low; that the public is well served, the passenger service especially being of the very best; that governmental regulation is not hampered or thwarted by the strength of the railways as monopolies; that no mischief and much good seems to have come from the elimination of competition between lines, and that upon the whole the French scheme secures a maximum of adequate, efficient and satisfactory service at a minimum of cost and friction.

**Belgium.**—The policy of government ownership is perhaps best typified by the Belgian system. Of all countries in the world Belgium probably offered the best field for a state railroad. The country is small, compact and rich, the population crowded, active and intelligent, and the industries varied, all which insured a large volume of local traffic. Moreover, Belgium is on the highway between England and Germany, so that, in addition to a dense local traffic, the Belgian lines were certain to secure considerable through traffic on commodities moving between England and Germany. There was in consequence of all this little room for mistake in locating the main lines, and they were, as in France, for the most part laid down intelligently and built economically. Railway construction began as early as 1833. Private companies were allowed to build lines wherever the state did not choose to build, but competition between the lines owned by private companies and the state lines was not at any time part of the original scheme. Like the French, the Belgians saw from the start that competition would be uneconomic and wasteful. The private railways increased rapidly from 200 miles in 1850 to 700 miles in 1860, and 1,400 miles in 1870. This rapid growth of the private lines was accompanied by their inevitable consolidation into systems, and in spite of the fact that competition had not been contemplated, there began in Belgium about 1856 a period of railway war between the state and the private lines and among the private lines themselves. Theoretically, the state had and exercised the power to forbid the private companies from entering into any competition with the state lines, but, in spite of that, competition in Belgium after about 1856–57 was keen. The state had the better routes and in some sort the inside track, but some other advantages possessed by the private companies practically offset this advantage. This competition working the usual mischief finally drove the government to the expedient of buying out the private companies. This began about 1870. By 1874, the government owned more than half the mileage of the country. By 1880, it owned two-thirds, and in 1902, there were 2,516 miles of railway in the country, all or practically all of which is controlled by the state, either through ownership or lease, and competition is in consequence wholly eliminated. The total mileage in 1912 was 2,913, of which but 217 miles were private lines. The state now owns more than 90 per cent of the total mileage and operates almost all of the remaining by lease. This is in brief the history of the development of railways in Belgium. It appears that competition was not part of the original scheme; that it nevertheless arose and ran its course; that when the state realized the disadvantage of it, steps were taken to eliminate it entirely, and that this was done by the purchase of the competitive lines. There was at first the inevitable consolidation of the private lines, eliminating competition between those lines themselves, but intensifying it as between them and the government lines. Then came the consolidation of these lines with the state-owned lines by government purchase, and competition was at an end. It is another case of the universal tendency to combine, and of the powerlessness of government to prevent it.

**Italy.**— In 1878, a Parliamentary commission in Italy undertook an investigation of the railway situation in that country. Testimony was taken throughout the kingdom and an enormous mass of material collected. In 1881 this commission made its report to the government, which was subsequently published in seven quarto volumes. It was the most thorough railway investigation ever undertaken in the world and the report is probably the most valuable in existence. The material parts of it have been translated into French and are thus available. From the work of this commission it appears that, prior to the wars which resulted in the union of the Italian states in 1870, the principal railway lines of Italy not only were disconnected and independent of each other, but also constituted isolated or strictly local systems for each of the chief independent states. Thus the lines in Tuscany, in Lombardy and in Piedmont were wholly distinct both from one another and also from those centring in Venice, Rome and Naples. Some of the early charters had come from the emperor of Austria and one from the Pope; the lines were inadequate to the demands of the business of the country, the service was very poor and the companies substantially bankrupt and irresponsible, but there was plenty of competition. The problem after 1870 was to unite and consolidate these scattered and local lines into systems fit for united Italy, to construct new lines, to reconstruct old ones, to re-equip and to reconstitute; and then to operate the reconstructed lines as a whole. The range of mountains from north to south which constitutes the back-bone of the Italian Peninsula dictated a natural division of territory for the amalgamated lines. There was as of course much local jealousy to overcome. Although Italy was too poor to spend much money in experiments, there was thought to be danger to the autonomy of the new state in permitting foreign capital to come into the railways, and it was prevented by the government, so that, in consequence of all these matters and hindrances, things at first moved slowly. Connecting links were first built, which served to unite the isolated local systems, the plan being to consolidate the local parallel and competing lines rather than the connecting lines. Finally the roads fell into four systems — that of Upper Italy, that of Rome, that of the east coast and that of Sicily and the south. Here, as elsewhere in Europe, competition between parallel lines did not enter into the scheme of construction and reconstruction, and consequently consolidation was not only inevitable, but easy, and it was facilitated wherever there was duplication. Upon the division of territory between the four systems and with the consolidation of lines within those four territories respectively and the building of the connecting links, the problem of construction was in a way to be solved; or, in other words, the lines were laid down and ready for operation. Next came the problem of ultimate ownership and present maintenance and operation. Soon after 1870 the state had begun to buy up the lines, especially in the north, where there was danger from Austrian influence, and by about 1875 a considerable part of the mileage of the kingdom was owned and operated by the state. So that by that time Italy seemed committed to what may be called the Belgian system of state ownership and operation. But Belgium was rich and Italy was poor, and it was soon found that the state was neither managing the lines well nor making any money out of it; there was, therefore, general dissatisfaction throughout the country with the railway system; neither the poorly served public nor the depleted treasury of King Victor Emmanuel was satisfied. It was in that state of affairs that the investigation of 1878 was undertaken, the result of which was that the Italian statesmen who had the matter in hand came to the conclusion that it was not the proper function of the Italian state to run its railways: that state management in Italy had proved more costly and less satisfactory than private management, and that the carrying on of so vast an undertaking by the new state involved political risks and dangers of a serious nature. The outcome was the chartering in 1885 of three private companies, one, the Adriatic, for the territory on the east of the Apennines, a second, the Mediterranean, for the territory on the west, and a third, the Sicilian, for Sicily, the two systems in the peninsula being about equal consequence, while the one in Sicily was, of course, smaller. A fourth company has since been chartered to operate the lines in Sardinia. These companies were to take over the rolling stock of the lines within their respective territories at a valuation, and thus become the owners of it, and to maintain and operate the lines, dividing the gross receipts with the state on an agreed basis. So that the ultimate solution was that the state was to own the lines, where private companies were to operate them. Practically the railway business of Italy proper is in the hands of two companies, one on either side of the Apennines, the lines meeting at Naples, Rome, Florence, Milan and elsewhere. Between 1881 and 1897 the length of the Italian railway system almost doubled itself, and in 1898 there were 9,813 miles of line open for traffic. Since which time there has been practically no increase in the mileage. In 1912 there were reported 8,387 miles of state railways. The service is satisfactory and the railway system is making rapid progress throughout the kingdom. Thus we see that in Italy competition preceded combination; that it was found to work mischief and that attempts at combination were the inevitable result; that when the matter was taken seriously and intelligently in hand by the state competition was eliminated by law and the territory divided; and that then, and then only, were satisfactory results secured in railway operation. It appears, therefore, that whether we choose state operation as in Belgium or reject it as in Italy, it is the same as far as competition and combination are concerned; that the same economic laws govern in each case, and that in the long run competition is eliminated.

**Germany.**— Railways in Germany grew up very much as they did in England, at first without any general plan and without any real comprehension or appreciation of the problems involved. The Germans, however, like the English, seem to have started right on the question of competition. Their earliest statutes explicitly recognized the right to a monopoly in their first lines. The country then consisted, aside from the central kingdom of Prussia, in large part of a number of semi-feudal principalities, and local railway system sprang up in each of the states, which in 1914 constituted the German Empire, so-called. Prussia followed Belgium in a general way in her early legislation and initial construction. The first state railway in Germany was built in Prussia about 1848–50, from Berlin toward the Russian frontier. Other state lines followed, but *pari passu,* many private lines were laid down, some of them securing some state aid, by way of guarantees or subsidies or stock subscriptions from the principal states. Some, however, even of the smallest principalities, at first owned their lines outright and operated them too. So there was at the start every sort of a railway in Germany. This haphazard and piecemeal work begot the inevitable result — fierce competition everywhere among the private companies and between them and the state roads. The results were extremely dissatisfactory; the service was poor and the rates high. About 1861 Bismarck came into power, and from that time dates the influence of militarism upon the railway system of Germany. It has since shaped and colored the whole development and operation of the German lines. He saw clearly enough that the mixed and competitive system was a bad one, not only from a military point of view, but also from the point of view of the country at large. Steps were, therefore, gradually taken, in Prussia especially, to acquire the private lines and to consolidate competing and conflicting interests. The matter moved slowly because the country was poor, but the mileage nearly doubled between 1865 and 1875. After the war with France in 1871, more rapid progress was made in unifying the railway system of the country. By 1878, there were about 3,000 miles of state-owned and operated lines, 2,000 miles of privately-owned and state-operated lines, and about 6,000 miles of privately-owned and privately-operated lines. In 1881, the government owned more than 7,000 miles of line, only about 3,000 miles remaining in the hands of private companies. In 1885, the government owned 13,000 miles of line in Prussia alone while only 1,000 miles remained in private hands. In 1900, there were 30,597 miles of railway in the German Empire, more than 93 per cent of which were owned and operated by the state. In 1913 the total mileage was 37,894, of which 2,205 miles were private lines. The increase since 1900 consists almost exclusively of lines constructed for military reasons mostly on the western frontier facing France. Under the law the government was required to manage the railways "in the interest of general traffic as a single system," and in 1886 the government issued a Code of Railway Regulation, applicable to the whole railway system of the country. Competition practically ceased in Germany by about 1875, and for the past quarter of a century the railways of the country have been operated on non-competitive lines. Pooling arrangements with the canals and other competing waterways are sanctioned, in order fully to eliminate wasteful competition and unjust discrimination.

**Austria.**— In 1912 Austria had 14,185 miles of railways, of which 863 miles were narrow gauge and 2,501 were private lines; Hungary has at the same time 13,303 miles of lines, of which 2,098 were private lines. In 1901, Austria-Hungary had only 39,014 kilometers of line open for traffic. The first Austrian charter was granted in 1836, and construction went on actively thereafter until the revolution of 1848. The original idea was to follow the French system, and have the lines built and operated by private companies. Their statute of 1838, it may be noted, was the first general railway law enacted in any country in the world. It provided for undertakings by private companies, and for guarantees by the state of interest upon the cost of construction; it limited dividends on shares to 15 per cent, and absolutely prohibited the construction of paralled lines. It was discovered, however, as time ran on, that the French system was not well suited to the condition of things in Austria; and in spite of statutory prohibition, as the lines were constructed and put into operation, competition ran riot. There was also the usual iniquity growing out of constructing lines for a chance to speculate in the securities; and the competition of the waterways — of the Danube and the canals — although pooling between them and the railways was allowed and encouraged, added to the confusion and disorder of private management. So in 1873, Austria fell into line with the other countries of Europe, and started off in the direction of state ownership and control. In 1885, about three-quarters of the mileage in Austria was, however, still in the hands of private companies, but all the lines in Hungary were at that time owned and operated by the state. By 1898, more than half of the Austrian lines were under state management, and the tendency sets more and more in that direction.

**Russia.**— In 1910 Russia (including Russia-in-Asia) had 41,622 miles of completed railway, not including Finland with 2,039 miles of line, and 8,000 miles under construction, including the great Trans-Siberian line, which is the greatest railway enterprise yet undertaken anywhere. Work began on this line in March 1891, and it is now open for traffic. The estimated cost is about $500,000,000. The distance all rail from Paris to Port Arthur or Vladivostok is about 7,000 miles, with a through-car service from *la Gare du Nord* to Port Arthur and Peking. The government furnished a large part of the capital required for construction, and owns and operates about two-thirds of the total mileage in European Russia; it has in addition subsidized and thus controls and dominates the policy of the lines owned and operated by private companies.

**The Minor Countries of Europe.**— Elsewhere in Europe we find the same variety in railway operation and control as in other things; but the tendency everywhere is to government ownership or to such a strict government regulation as effectually eliminates anything like competition between the lines. Thus in Norway, in 1915, there were reported 1,948 miles of line, all now owned and operated by the government; whereas in Sweden, at the same time, there were 8,984 miles of line in operation, of which only 2,392 were government lines. But although in 1893 there were reported to be not less than 108 different owners of private lines in Sweden the law strictly and successfully prohibits competition between them, or between them and the state lines. The last available figures for the Spanish lines show 9,517 miles open for traffic in that country, all, as in Portugal, owned by private companies, but supported and controlled by the state. In Switzerland, where in 1915 there were 3,148 miles of line in working order, the governmental supervision has until recently been much the same as in Spain. In 1898, by popular vote, it was determined (in view of the evils of over-construction and some hurtful competition in spite of legislative prohibition) to purchase for the government the five chief lines, thus putting Switzerland in the Belgium class of countries owning and operating their railway lines. This scheme was gradually financed and carried out by the Swiss government. The railway history of these relatively unimportant European countries is of much less interest and value to us than that of the greater states. The Italian system has been followed substantially in Holland, and in Denmark, and by some of the other minor Scandinavian countries.

**India.**— The construction of railways in India, which commenced in 1853, has been conducted on three different systems: first, the employment of companies under a system of guarantee; secondly, by the state through its own officials; and thirdly, by assisted companies either with or without guarantee or subsidy from the state, and working with capital wholly raised by themselves or partly with capital provided by the state. Out of eight lines constructed on the first system, five have been purchased by the state. Two of these are worked by companies. The more important, the East Indian line, is carried on by the same company that constructed it in the first instance, on special terms as to the sharing of profits. The second, the South India line, is in the hands of a new company, whose capital was subscribed by the shareholders of the old one. The three remaining lines are worked by the state, and all five come into the category of state lines in the accounts of the government of India. The total number of miles of Indian railway open for traffic in 1915 was 34,572. Although construction began about the middle of the last century, the system has been developed almost entirely since what English writers on railway problems speak of as «the rise and fall in England of the great fever known as the railway mania,» to which detailed reference has hereinbefore been made. The Indian railways were, therefore, planned and constructed in the light of the experience afforded by the home construction and development, and many of the cruder home blunders were thus avoided. They now fall into one or other of four classes: (a) State-owned lines, worked by companies; (b) state-owned and state-operated lines; (c) lines constructed by guaranteed companies and (d) lines constructed by assisted companies. The English government, following the French lead in that respect, provided for a system of guarantees, by which the necessary funds were cheaply found; in laying down the lines paralleling was avoided, and competition effectively prevented. Where there is no competition there is the less incentive for combination, and there seems, therefore, not to have been any great tendency in the Indian lines to combine. These Indian railways seem to be rather poor affairs; there is much complaint of indifferent service and high rates. How far these things may be chargeable to the inefficiency of the government or may be due to the system itself does not appear. They have up to the end of 1899 involved a yearly loss to the Indian revenues, but the working of the year 1900 resulted for the first time in history of the Indian railway system in a net gain to the state of Rs. 87,239, and in 1901 Rs. 1,154,119. From the commencement of railways in India, about half a century ago, to the end of the year 1899, the loss to the Indian revenues amounted to Rs. 57,811,487. Whatever else may be true of the Indian lines, they have been constructed and are operated entirely on the principle of non-competition and division of territory, and there being no competition there has been little tendency to combine; in other words, the evil of competition not existing or not being allowed to exist, there is no call for combination. This is, as has been said, negative evidence in support of the contention that wherever competition is possible combination is inevitable.

**Mexico.**— The railway situation in Mexico is fully disclosed in an exceedingly valuable report made some years ago to the government by Senor Limantour, Secretary of Finance. It purports to have been based upon a careful investigation of the facts, and is on the face of it as intelligent and comprehensive a state paper as any that has emanated in recent years from any government office anywhere in the world upon the subject. The fact that Senor Limantour, who was then virtually prime minister of Mexico, and had been nominated by President Diaz as his successor in the presidential office suggests his high standing at home and gives weight abroad to his views on these questions. This report, which seems largely to speak the voice of the secretary himself, deals at length with the problems of competition and combination, and discloses the fact that the policy of the Diaz administration, as now settled and determined, is to meet and solve these problems by absolute government ownership, rather than by any further futile attempts at legislative control. The government, finding that the general railway law of 1898 (from which, when it was passed — as in the case of our original Interstate Commerce Law—great things seem to have been expected) was proving inadequate to the due regulation and administration of the lines, and realizing the necessity of stronger and surer governmental control, has lately come to the policy of going into the open market and of adopting the same tactics as private individuals or companies in purchasing the shares of such lines as it desires to control. Mexico is, therefore, now fully committed to the theory of governmental ownership, if not to that of governmental operation. Those portions of Señor Limantour's report which disclose the processes by which the government has acquired and is acquiring such a proportion of the shares of the leading lines as will give it due preponderance in their control are very interesting. The explanations of the causes which have moved the government to this step, as contained in the report, are of an even wider interest and significance to students of the railway problem. In brief, Senor Limantour's explanation is this: The government has until recently been in the usual elementary attitude of encouraging by concessions, subsidies and otherwise all the railways which either citizens or foreigners would undertake to build and operate as private enterprises, in the supposed interest of the most rapid possible development of the country. It was only in 1898 that a general railway law was passed, which, however, soon proved entirely inadequate. It was, therefore, in addition found necessary to prescribe new rules relative to granting concessions for competing lines between points already connected, and to establish a tariff commission — something like our Interstate Commerce Commission — which was an attempt, through the agency of a governmetal bureau, to prevent combinations in freight rates, and to regulate them in the public interest. In the light of the experience of other countries — and, as it appears, especially in the light of the experience in the United States — competition between the lines is by this report pronounced harmful, «except where traffic is large enough to support it» — whatever that means. Government ownership and regulation is declared to be the only real preventive or remedy against such disastrous competition—with its inevitable result of the consolidation of competing interests. It is further suggested that the fact that groups of foreign capitalists had undertaken to consolidate several of the principal lines, obliged the government to take a definite attitude lest their great railway properties should thus be taken over and controlled by alien capital. It was clearly seen that these contests for territory between the hitherto conflicting interests would eventually and inevitably result in either the forced or the voluntary consolidation of the competing systems. The law as it stood was inadequate to prevent the acquisition in the open market by any private interest of a control of the shares of any company sought to be acquired, and there was no way to prevent the consolidation of interests through voting trusts or otherwise. Specifically, the situation in the early part of 1902, which seemed to drive the government strongly in the direction of state ownership and control, was this: The railways of the country were found already to be in the hands of no more than four groups of capitalists, namely, the Central, the National (having lately absorbed the International), the Interoceanic and the Mexican — all but the last showing great expansive activity. The Central especially, by the recent purchase of exclusive port concessions and the building of new lines in and out of the City of Mexico, was threatening to cripple the National line. Plainly, therefore, consolidation between it and the Central would inevitably follow in the ordinary course. Meanwhile, through Messrs. Speyer and Company, the National was trying to acquire the control of the Interoceanic route, but this was frustrated by the government. Various circumstances favored the government as against the foreign bankers in its secret move to secure control of the Interoceanic's debentures. «The ability and high financial standing,» says the report, «of the firm representing the interests of the Mexican National constituted a serious obstacle to the attainment of our aims, and it was necessary to act as we did with decision, rapidity and absolute secrecy.» A proposition for a common exploitation by the government in association with the National, the International and the Interoceanic companies followed: «but it was soon recognized that such an arrangement could not have the necessary durability nor afford the indispensable conditions whereby the companies might secure themselves definitely against the hostility of other corporations to which they might be exposed in time.» The government thereupon, wisely declining to be drawn into any partnership arrangement with the companies, reverted to its original plan, namely, an arrangement such as would give the state primary and absolute control of the three systems, and in such a way as to protect each of them against such future competition as would be sure to arise under the existing state of things. The report declares that the government has now determined to grant no concessions hereafter for competing parallel lines, except in territories where dividends can be earned by each such line. Several voting trusts, in some of which the government has had an interest, have existed in Mexico, but some of these have lately been dissolved upon the advice of American counsel.

It was at first proposed that the government should exercise control of the new consolidated system through the voting trust of the National, already in existence. But, «according to the valued opinion of American attorneys, who are specialists in affairs of this nature, it would have been attended with many objections of a legal character, and have proved a fruitful source of litigation.» Accordingly, the consent of its three members was obtained, and the voting trust dissolved, an agreement being entered into with Messrs. Speyer and Company whereby they were to secure for the government 40 per cent or more of the voting shares. The report then enters into a detailed account of the steps by which this was successfully accomplished, 47¼ per cent of the shares being thus secured. It also goes fully into the question of the probable earnings of the consolidated railways and of the issuance of treasury notes for $12,500,000, American gold, to pay for them. The advantages to the government, growing out of the control of the new consolidated system, is summarized in the report as follows:

> 1. The having obtained by one stroke the control of the lines belonging to the National and International without losing control of the Interoceanic.
>
> 2. Having secured a considerable reduction in the total cost of the operation; and
>
> 3. The ability to effect payments in such manner as in no wise to disturb the equilibrium of the budget, and out of funds which in the long run will be recovered by the state.

Repeated reference is made throughout the report to the railway situation in the United

States, and it is obvious that American experience has influenced the Mexican government in its new departure in the direction of state ownership. From a return prepared by the French Ministry of Public Works, it appears that there were in Mexico in 1870 no more than 349 kilometers of line; that in 1880 there were only 1,120 kilometers, while in 1890 there were 9,713 kilometers, in 1900 a total of 15,454 kilometers and in 1917 15,805 miles of railway in operation — now, as we have seen, all substantially under government control or presently to pass thereunder, as the result of the investigation and comparison of the advantages of private versus government ownership and operation set forth in Señor Limantour's report.

**Australia, etc.**— In Australia, state ownership and control has since about 1860 been absolute and universal. The latest available statistics show 21,959 miles of line open. This includes about 2,500 miles of line in New Zealand. While there was at first some construction by private companies, every mile is now state railway. The figures intimate that there is no serious competition there.

**South America and Africa.**— In South America the governments generally own the lines. In Brazil, in 1915, there were 15,491 miles of line open. Of this mileage the state actually owns but a small part, but it subsidizes the rest and thus exercises an efficient control over all, which effectually prevents duplication and competition. In the Argentine there were reported in 1915 20,593 miles of road, mostly government lines. Chile in 1915 reported 3,949 miles open, of which 1,458 belong to the state. The French possessions and dependencies in North Africa reported, in 1900, a railway system amounting to 4,628 kilometers in length, as against 3,595 in 1890 and 517 in 1870; British South Africa seems to have had, in 1900, nearly 6,000 kilometers of lines in operation. There were about 2,000 kilometers of line open in the Transvaal at the commencement of the Boer war and about 400 kilometers in the Kongo in 1900. The total length of all operated lines in Africa, including the foregoing, the Egyptian lines (2,063 miles), and some little development in Portuguese East Africa, amounted in 1915 to about 23,472 miles, substantially all of which is government line. Competition and combination are, therefore, not open questions in Africa. The several European countries that have built the lines there either operate them directly or see to their operation on a strictly non-competitive basis.

**Conclusion.**— From the foregoing general view of railway history and development throughout the world, it appears that there is a universal and irresistible tendency in competitive railways in the same territory to combine and to divide the territory between them; that attempts by legislation or litigation to prevent it have uniformly failed; that states which at first recognized and sought to enforce the principle of competition between railways have one after another ultimately abandoned the attempt; that nowhere, except in the United States, is the principle of competition now recognized or still sought to be enforced; that railways in new countries or colonies of old countries, constructed during the last quarter of a century in the light of the experience of the older countries as to competition, have been constructed and operated from the start on non-competitive lines; that the amalgamation of parallel and competing lines is entirely consistent with good service, reasonable rates and adequate governmental supervision and control; that where railways compete there is always an enormous waste of capital and effort and frequently poor service and high rates; that the tendency everywhere is to eliminate competition where any measure of it still exists; that government ownership is good or bad according to the point of view; that there is a strong tendency in Europe and elsewhere except in the United States and in England, toward government ownership and operation; that the governments of Europe, with 10 times the police power of our own, have long since abandoned all attempts to hinder and thwart the laws of trade and commerce by restrictive legislation, or to prevent the inevitable in railway development; that, instead of opposing this economic evolution, the most enlightened European governments have on the contrary legalized it and seek to enforce and regulate it in the public interest; that the best and cheapest service is secured where competition is impossible and where the state puts the emphasis of its effort, not on interference with railway finance, but on securing good service at fair rates.

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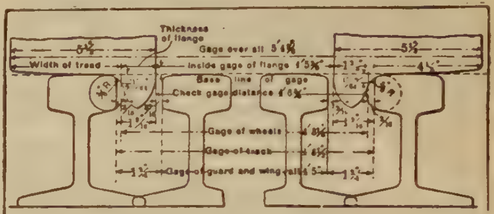
**RAILWAY CONSTRUCTION.** See RAILWAY ENGINEERING AND CONSTRUCTION.

**RAILWAY CONSTRUCTION, Street.** See STREET RAILWAY CONSTRUCTION.

**RAILWAY ENGINEERING AND CONSTRUCTION.** In railway engineering the railway track more than any other part of the railway machine had a crude beginning and has reached its present condition of excellence by a continuous series of improvements. In the first stages of construction, tracks of numerous designs were built, the chief thought of the builders being to secure a solid structure that would not allow the rails to spread. The track was of necessity relatively heavy and expensive in relation to the weight of the rolling stock and volume of traffic. Three kinds of rails were used, the one most generally employed consisting of strong wooden beams, surfaced with strap iron. The iron rails first used were cast and their length did not exceed three and one-half feet. Rolled rails were soon substituted for those of cast-iron and the length was increased to 15 feet, with a weight of about 40 pounds to the yard. Up to 1844 all rolled iron rails used in the United States were 15 feet in length. The T-rail now universally employed was not much used during the first 20 years of railroad construction. Since 1870 rolled steel has been used instead of iron and the weight of the rail has been steadily increased to 110 pounds to the yard. One hundred pounds to the yard has become the standard upon tracks where traffic is heaviest. The standard length of rail has been maintained at 30 feet, but at the present time some track is being laid with rails 60 feet in length. Along with the improvements in the track, bridges and other structures have been strengthened to meet the necessities of the modern transportation methods.

The whole trend of modern engineering is toward constant increase in the search after and adoption of labor-saving appliances, on the one hand, and constant increase in the development and elaboration of systems on the other. This is especially true in railway engineering, and an examination of recent subway, tunnel and bridge constructions and other engineering operations serve to point out the wonderful progress in engineering methods and the present easy accomplishment of former undertakings either abandoned or considered impossible.

**Construction.**—A perfect and safe track is complete in all respects when full bolted, full spiked, well ballasted, surfaced, lined and gauged. The best dirt ballasted track is made when laying it, by bedding the ties to a level surface on top before putting on the rails. If it is intended to ballast track with cinders, gravel or stone, as fast as it is laid, the tie bedding is omitted in order to have the full width of the grade upon which to deposit the ballast, but at the same time the ballasting should be kept well finished up to obviate the danger of spoiling the rails. When laying the rails care is taken to give the proper space at the joints for expansion. Too much space at the joints must be avoided in order to prevent the car wheels from battering the ends of the rails. The coefficient of expansion for steel is .0000065 of its length for each degree. For a rail 30 feet long and a difference of 100 degrees, or from 10° below zero to 90°, the amount to allow would be one-quarter inch. To take up the flow of the rail one-eighth inch must be added, making a total allowance of three-eighths inch. A steel rail expands or contracts 1-100,000 of a length under a load of one ton (2,240 pounds) per square inch. This is also its expansion under a rise of 15° of temperature: consequently, if a 30-foot rail is subjected to a rise or fall of 15°, it exerts a force of one ton per square inch if resisted. Where angle bar splices are used on joints the best method to hold steel and to keep it from creeping down



The Standard Terms and Points for Gage of Wheels and Track.

| Rails | | Ties | | Spikes (4 to each tie) | | | | | | Bolts (4 to each joint) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | No. of kegs per mile for ties | | | | | | No. of kegs per mile for rails of — | | |
| Wt. per yard | Long tons per mile | Distance c. to c. | No. per mile | Length under head | Size | No. per keg of 200 lbs. | 21 ins. c. to c. | 24 ins. c. to c. | 27 ins. c. to c. | Length under head | Size | No. per keg of 200 lbs. sq. nuts. | 30 ft. | 30 ft. 10% short | 33 ft. |
| *Lbs.* | | *Ins.* | | *Ins.* | *Ins.* | | | | | *Ins.* | *Ins.* | | | | |
| 100 | 158 | 18 | 3,520 | 5½ | 9/16 | 360 | 33.0 | 29.3 | 25.7 | 5 | 1 | 115 | 12.2 | 12.5 | 11.1 |
| 90 | 142 | 21 | 3,017 | 5 | 9/16 | 405 | 29.3 | 26.0 | 22.8 | 4½ | 1 | 120 | 11.7 | 12.0 | 10.7 |
| 80 | 126 | 24 | 2,640 | 4½ | 9/16 | 460 | 25.9 | 23.0 | 20.1 | 4 | 1 | 125 | 11.3 | 11.5 | 10.2 |
| 75 | 118 | 27 | 2,348 | 5 | ½ | 505 | 23.6 | 21.0 | 18.4 | 4½ | ⅞ | 162 | 8.7 | 8.9 | 7.9 |
| 70 | 110 | 30 | 2,113 | 4½ | ½ | 535 | 21.3 | 19.8 | 17.3 | 4 | ⅞ | 170 | 8.3 | 8.5 | 7.5 |
| 65 | 103 | Joints | | 4 | ½ | 605 | 19.8 | 17.5 | 15.3 | 3½ | ⅞ | 188 | 7.4 | 7.7 | 6.8 |
| 60 | 95 | Length of rail | No. per mile | 3½ | ½ | 670 | 17.5 | 15.9 | 14.3 | 4¼ | ¾ | 195 | 7.2 | 7.4 | 6.6 |
| 56 | 88 | | | 4½ | 7/16 | 690 | 17.5 | 15.5 | 13.5 | 4 | ¾ | 200 | 7.0 | 7.2 | 6.4 |
| 50 | 79 | 30 ft. | 352 | 4 | 7/16 | 780 | 15.3 | 13.6 | 11.0 | 3¾ | ¾ | 208 | 6.8 | 7.0 | 6.2 |
| 45 | 71 | 30ft.10% short | 360 | 4½ | ⅜ | 780 | 15.3 | 13.6 | 11.0 | 3½ | ¾ | 216 | 6.5 | 6.7 | 6.0 |
| 40 | 63 | 33 ft. | 320 | 4 | ⅜ | 1,025 | 11.5 | 10.2 | 9.0 | 3½ | ⅝ | 329 | 4.3 | 4.4 | 3.9 |

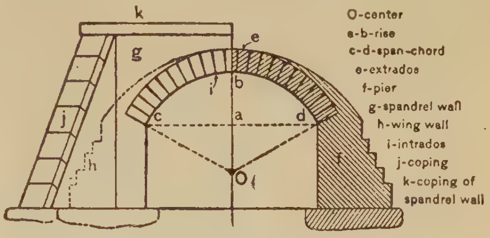
Quantities of material per mile of single track.

grades or from running ahead enough to throw the track out of line or kink the rails, is to use the slot spikes in the splices. Short rails (less than 10 feet in length) should never be used in making connections except in cases where it is absolutely necessary to use short pieces of rail as at the ends of frogs, in the round house tracks, etc.

**Spiking and Gauging.**—All track should always be kept full spiked and in perfect gauge. Bad gauging detracts from the appearance of an otherwise good track, makes track easier to knock out of line and down below surface, and is the direct cause of wrecks. The spikes should be driven about two and one-half inches from the edge of a track tie. Both inside spikes should be driven on one edge of a tie and both outside spikes on the other edge in order to prevent the tie slewing and also to assist in holding the rail from creeping. The standard gauge on American railroads is four feet eight and one-half inches; according to conditions, broad gauge is greater and narrow gauge lesser than standard width.

**Drainage.**— In order to ditch a cut properly it is necessary to take measurements from the rail to the bottom of the face of the cut, at different points along the cut, and ascertain at what average distance from the track the back of the ditch should be located. The width of a cut and the slope of its face on each side of the track will govern, to a certain extent, how far from the track rails to place the back of the ditch. The ditch should be deep enough to thoroughly drain the track and the distance from the rail to the back of it should be in proportion to the depth of the ditch, giving the water an easy fall from the track and free passage through the ditch, avoiding all danger of its washing the shoulder of the grade or undermining the track. As a general rule the bottom of the ditch should be eight to 10 feet from the rails where the grade width will allow it, and about two feet below the bottom of the ties. When the track is ballasted with dirt the slope should commence in the centre of the track two and one-half inches above the ties, falling at the rate of one and one-half inches to the foot. From this point, which is three feet outside the ties, and two inches lower, the incline should be greater, about in the proportion of four inches to the horizontal foot. If the track is ballasted with gravel the slope toward the back of the ditch should commence about two feet outside the track rails, the ballast at this point being level with the base of the rails. To insure a thoroughly good drainage all the water which falls upon the track or adjacent land should be conducted through ditches, culverts, bridges or other channels to the nearest running stream that will take it away beyond all possibility of injuring the track. Where muskrats or minks are plentiful and cause damage to the track by burrowing under it, a heavy coating of cinders and slag along the sides of the embankment is an effectual protection against their depredations. The cinders form an acid in the water and at the same time are too sharp for the animals to burrow through.

**Vitrified Pipe Culverts.**— The use of vitrified pipe for culverts under railroads has continued in constantly increasing volume since 1878; its advantages are now fully appreciated and experience has pointed out such treatment as will ensure the best results in efficiency and permanency. In northern latitudes especially, where severe cold prevails, the culvert should have a good fall, and be so constructed that no standing water be allowed to remain in the pipes and freeze. When drainage capacity greater than that afforded by one pipe is desired, two or more lines of pipe may be laid side by side. This practice is quite common, and gives an important advantage in that the full capacity of pipes is utilized at a lower depth of water, but the separate lines for pipe should be laid far enough apart to secure a solid bed for each one. No arbitrary rules can be made for work of this character. Varying physical conditions must be met and each particular work treated separately on its merits. Under especially favorable conditions of good soil, light embankment and good drainage, there is no doubt that the pipe culvert may be put in without cement and without end abutments, ensuring complete construction at minimum cost, but the durability of vitrified pipe being conceded, the permanency of the work is a prime consideration, and the wisest economy would seem in all cases to suggest the use of concrete as a foundation for the pipe, and that each end of the pipe culvert be protected by parapet walls of substantial stone or brick masonry.



Lines and Surface of an Arch Culvert.

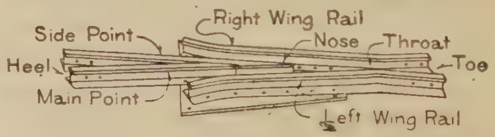
**Ballasting.**— If stone is difficult to obtain a good track can be made with gravel and stone combined for ballast. The foundation for the track is laid with broken stone and above it placed a quantity of coarse gravel sufficient to bed the ties, surface the track and dress it. Cinders are equally effective as a ballast, except in wet cuts, where stone should be used, and are cheaper than either stone or gravel. Six inches of cinders will absorb about one inch of rainfall, and will thus keep the foundation beneath the ballast dry. They make a superior ballast on clay fills or gumbo bottoms, and are a positive exterminator of weeds. Where the subgrade is well drained and solid, an excellent track can be made by ballasting with two cars of gravel in a place, and to accomplish the work in this way, estimates may be taken at the rate of 325 cars of gravel to the mile of track. The embankment should not be less than 14 feet wide on top before putting on the gravel. Although locomotive cinders, furnace slag, burned clay and gravel make excellent ballasts, within the past few years the best results have been obtained from stone ballast where the stones are sufficiently small to pass through a one and one-half inch ring. The first cost of stone ballast is large; but once in place and thoroughly tamped it is extremely solid, will arrest the springing action of the track and will ensure a nearly perfect drainage.

**Laying Rails.**— Owing to the difference in quality and in the amount of traffic over the rails, it is quite difficult to form a correct estimate of the average life of the same. Good iron rails have been known to last, in service on the main track of a railroad doing a fair business, nine or 10 years, and steel rails 15 to 20 years. There is much discussion on the subject of broken or even joints. The majority of track has heretofore been laid with even joints; but at the present time all rails are being laid with broken joints, which consists in placing the rail joint on one side of the track opposite to the centre of the rail on the other side of the track. Outside of the general line and surface the principal defects in steel rails are pipes, gag marks and cinders, which result in flaws. (See Iron and Steel, Metallography of). Owing to heavy engines and cars of great weight now employed, heavy rails are demanded to be used and as the height gives vertical strength, in such heavy rails used, height should be the main consideration and should not be less than six inches. To give good wearing heads, the proportion of metal in the head should be kept down to the minimum, as owing to the present process of rolling steel rails at a great heat from a large ingot, a thick head will not give as good results as a thin head rail. The web should be thicker at the base than under the head, which in the high rail ensures greater strength, as the tendency is to break at this point, if too weak.

**Wave Motion.**—As all movements are on the principle of the lever, there is of necessity an undulatory motion on the passage of each train, the amount of which being dependent on the condition of the sub-grade, ballast, ties, rail and weight of the rolling stock. The less substantial the superstructure the greater ballast compression there will be, and, of necessity, a rough-riding track. The foundation of all ties being loosely compacted material, any movement or «churning» of the tie necessarily throws unequal loading on the ballast at different times, causes its compression and movement, and destruction of the tie foundation. The wider the ties and the lighter the rail and heavier the loads, the greater such movement must be. Rails take a permanent set, as regards wear motion, in one of three forms: (a) Joint low and centre high; (b) joint and centre low, quarter high; (c) entire rail level. As the vibratory motion of the rail takes place something has to give way. If the fastening to the tie is by push bolt or lag screw, the tie will be raised with the vibration and «pump» the ballast, and in time the fastenings will become loose.

**Elevation of Curves.**— The elevation of curves has been a subject of much discussion. Thirty years ago one-half inch elevation per degree of curve was considered proper; but, now with faster and heavier trains a greater elevation is required. Engineers claim that one inch per degree for a speed of 60 miles per hour is proper for curves of three degrees or less, but for each additional degree the elevation should not exceed three-fourths inch. While practice teaches the amount of elevation needed in any given case it is a safer plan to follow the ensuing formula deduced from mechanics in following the theory of elevation: $E = \frac{V^2 G}{32.16\, R}$, in which E represents the elevation in feet, $V^2$ the square of the velocity in feet per second, G the gauge or the distance between the points supporting the wheel, or from the centre of one rail to the centre of the other, and R the radius of the curve in feet. This rule, though scientifically correct, cannot always be applied in actual practice, because all trains do not travel at the same rate of speed. Practical provision must be made for the average speed of trains and the number in each class of service. For example, if a road have two trains whose speed is 50 miles per hour, four with a speed of 40, and six or eight with a speed of 25 miles per hour, one inch per degree of curve will be found suitable. The pressure by the fast train against the outer rail of a curve will not be sufficient to spread the rail or throw the track out of line. The elevation will be about right for the 40-mile trains, and while it may be excessive for the slow trains, yet they will do no particular damage to the track and will have a tendency to prevent the track being moved permanently outward by the fast trains. The liability of derailment of locomotives or cars is much greater on a curve track and a large percentage of such accidents is chargeable to the defects in the rolling stock as well as to the defects in the track itself. Heavily loaded cars often leave the track owing to the failure of a track to adjust itself to the curve of the track, caused, perhaps, by a defective curve roller, and the greater part of the load resting upon one side of the track.

**Frogs and Switches.**— The turnout, by which a car may pass from one track to another, consists of a frog, a rail leading to the frog, a corresponding opposite rail and a device connecting these rails with the main track known as the switch. If the switch is made to serve two turnouts, it is called a three-throw switch; a trailing switch is one where a train on the main track passes from frog to switch; while a facing switch is one that approaches in the opposite direction. The common or stub switch consists of a pair of connected rails so arranged that one end is fixed; the other can be moved so as to be a part of either the main track or turnout. This switch has two serious defects—the want of safety, and the necessary space at the end of the moving rail, which jars the rolling stock, batters the switch rails and causes discomfort to passengers. The first cost of a point switch is more than a stub, but the split, which is more economical to maintain and safer, is cheaper in the end. In laying switches the general rule is to cut the least number of rails. When putting frogs into a track care should be taken to have them in a true line and level with the track rails which are con-

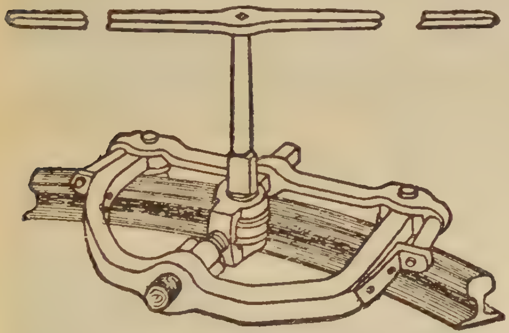


Frog.

nected to them. The gauge rail, opposite the frog, should be put to a perfect gauge for the full length of the frog.

**Safety Appliances.**— The greatest care must be exercised in the instalment of safety devices, as far as practicable automatic, without discouraging watchfulness on the part of engineers and others. The plan of sealing the stopping mechanism and imposing a severe penalty for breaking the seal is an excellent one. The most carefully planned automatic devices should be provided, and no railroad train, traveling at terrific speed, and representing enormous energy, should be allowed to run without any safeguard between itself and disaster beyond the watchfulness of one man, who may be taken ill, or suffer from a temporary mental aberration, or may even die suddenly and unnoticed.

**Curving Rails.**— Before any rail is spiked to its place in a curve it must be evenly bent from end to end, so that it will assure the proper curvature when lying free. This curving may be done by hammers, but that method is slow and the rail-curving machine is generally employed. This machine is made with either screw or hydraulic power, and is used for bending rails rather than for curving them. For many curves no rail-curving is necessary, the friction between the rail and the ties being sufficient to hold the rail in position. The extent of this flexibility depends on the weight and length of the rail, and can be found by trial. Three degrees and sharper curves usually require a curving of rails. Knowing the radius of the curve and the length of the rail, the *middle ordinate* of the rail can be taken from prepared tables. Each half of the rail, from the middle point to the ends, should also be tested for its middle ordinate to ensure uniform curvature. The middle ordinate of these half sections is one-fourth of the middle ordinate of the entire rail.


Rail Curving Machine.

**Grade Crossings.**— The crossing of one railroad with another at grade is a common condition. This offers a dangerous condition which may be fully protected by a system of signals, derails, etc., which enables trains to proceed over the crossing at speed and with safety. The installation requires for a single line crossing eight signals, four of which are erected about 500 feet each way from the crossing. These four signals are called home signals. Beyond these, a distance of 1,500 feet or more, are located the distant signals. If we were certain that signals would be obeyed at all times we would need no further protection; but we have not yet arrived at a degree of efficiency in discipline which ensures that trains will never run by a danger signal. It is the general practice in the United States to provide a derail at the home signal which is opened after all signals on the route are placed at stop. This derail is an ordinary switch point and if a train attempts to proceed to the crossing against a stop signal it is derailed. This seems a brutal method of compelling the observance of a signal. Experience has demonstrated, however, that the derail is a moral agent and is effective in its presence and is seldom called upon to perform its office. A clear signal cannot be given for the crossing until the derails on the opposite route are open, and the signals on that route are in the stop position and the signals cannot be pulled to the safe position on opposing routes.

The opening of a switch under a train is guarded against by the detector bar. A thin bar 55 or 60 feet long is hung in a vertical position on the outside of the rail at the switch point fixed on links clamped to the rail, and so arranged in the general scheme as to make it necessary for the operator to move this bar vertically above the rail before the switch can be unlocked or moved. If a car or train is standing on or passing over the points the bar cannot be moved because the wheels of the car prevent its rising above the rail, consequently the switch cannot be opened under the train. These bars are also provided on each side of the crossing so as to ensure against changing signals where a short or light locomotive may have passed the home signal toward the crossing but has not passed the crossing. This condition may be better protected by employing a track circuit between derails controlling an electric lock which ensures against change of signals until the train has passed entirely out of the limits of the derails. Where signals and switches are operated by lines of inch pipe carried on rollers and are compensated for change in temperature by what is known as a «lazy jack» these carriers, compensators and cranks are now usually fixed on concrete foundations.

**Draw Bridges.**— The protection of draw bridges is perhaps more important than grade crossings and for this work the interlocking machine is employed with the home and distant signals, and where practicable derails are used. The signal cabin may be located either over the pivot pier or on the shore. To ensure safety we must ensure that before a clear signal is given the rails at each end of the draw are down in place and locked, the draw itself locked to the abutment and the turning mechanism locked and that none of these conditions can be changed so long as the signal shows clear, and in reversing the order of movement the draw cannot be opened until the signals are at danger and the signals cannot be cleared until the draw is again closed, etc. The important device in this combination is the bridge coupler for pipe lines which must be uncoupled by the operator from the cabin before the draw is opened.

**Surveys.**— Surveys are location surveys and construction or final surveys. The instrumental location of a railroad does not differ materially from that described for a new wagon road, but greater accuracy is desirable, and a much more careful adjustment of curves and grades is indispensable. As with common roads, the grade will mainly follow the natural surface, but the line must be so located as to keep these grades within the adopted limit, which will usually be 2 per cent, though in exceptional cases and for short grades 4 per cent is allowable.

Natural drainage lines present the most regular and easiest gradients, and in a broad sense it may be said that every railroad location follows lines of drainage. When the head or source of one drainage line is reached, the location crosses the divide to the next. With few exceptions, drainage lines have slopes not exceeding those permissible for railroad location. The first requisite in considering a railroad location is to get the lines of drainage clearly in the mind. This done, start the exploration from the initial point on a straight line for the objective.

Before the survey is started, the maximum grade and degree of curvature should be decided upon, and in surveying the line the instrument men will know what their limitations are and will locate the line accordingly. This maximum grade should be the compensated grade. This is, when the grade occurs on a curve, an allowance of .04 per cent of grade should be added to the actual grade for each degree of curvature to give the compensated grade. When the level man finds the grade running steeper than the limiting grade, he will take a sufficient amount of side notes to determine the amount of excavation or filling that will be necessary to keep the grade within the prescribed limits; and if he finds the amount of excavation excessive, he may have to call back the transit man and have the line relocated. This should not happen frequently as the transit man should know the maximum allowable angle of slope and should locate his line accordingly.

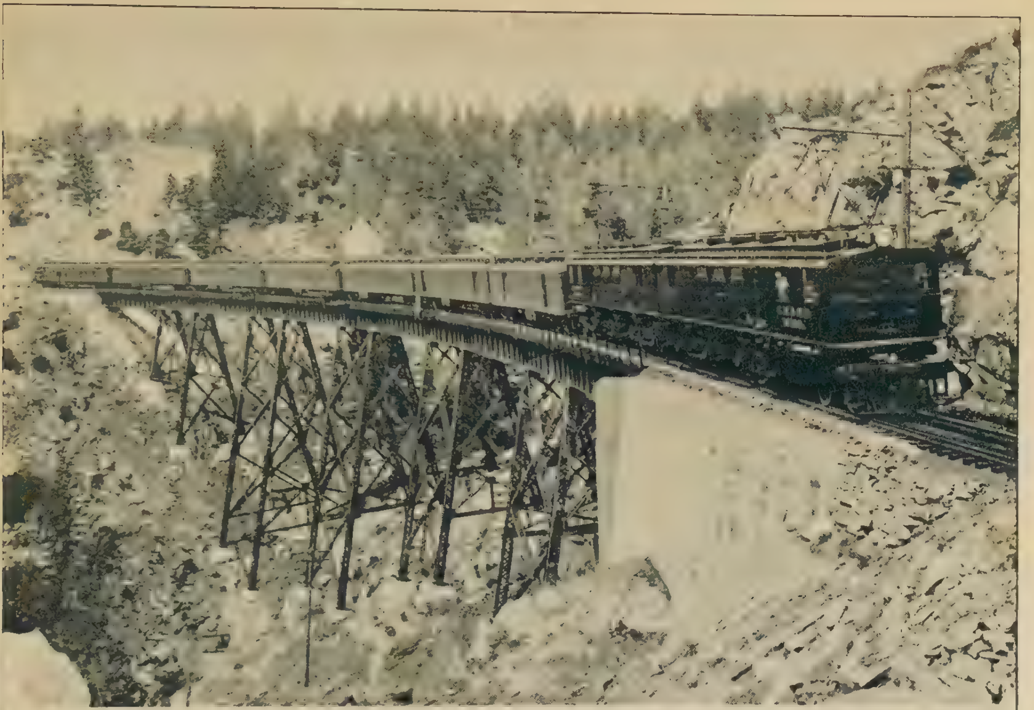
The virtual grade is the actual grade corrected to take advantage of the velocity head due to the speed of the train when the various grades are encountered. Its principal application is for economical construction, but even at moderate speeds it might occasionally permit the use of grades steeper than the so-called maximum. A pusher grade is an isolated case that cannot be kept down to the ruling grade nor compensated for by the velocity head. Here it is best to pass at once to nearly double the ruling grade and provide for a regular engine for that special grade. They should not occur oftener than once or twice in a division.

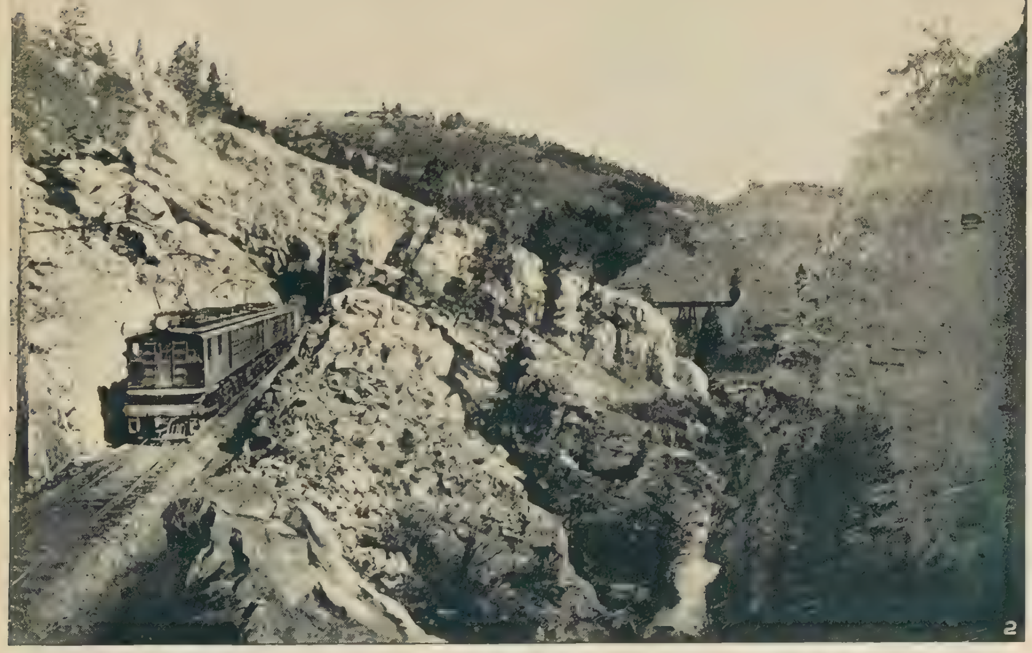
**Roadbed.**— The roadbed or the support for the track generally consists of the foundation and the ballast. The latter should be a material the consistency of which is not affected by water, and especially which does not become slippery when wet. Sand will do if nothing else can be had; gravel is better, and broken stone is the best of all. Cinders, shells, burnt clay and other materials are also used. The surface of the foundation on which the ballast rests is called the subgrade. Unless the natural ground is very unfavorable, it will not be necessary to use a separate material for ballast and the subgrade really disappears. Even then, the earth between and immediately under the ties which is dug into in surfacing the track is called ballast. Such roads are usually called mud roads. The cross section of the roadbed must be decided upon before the level party starts on its work, in order that they may know the dimensions of the roadbed for which the stakes are to be set. The dimensions of the roadbed of a two foot six inch track would be, approximately, 11 feet from shoulder to shoulder on a fill and 10 feet from shoulder to shoulder in a cut. The dimensions for a track of three-foot gauge will be about 12 feet from shoulder to shoulder on an embankment and about 11 feet in a cut. In excavations, plenty of depth should be allowed for ditches in order to ensure a dry roadbed.

Wherever the grades permit, the track is laid directly on the surface of the ground, and the necessary leveling is done after the track has been laid.

**Bridges.**— The engineer in the field during wartime on coming to an opening where a bridge is required plans the bridge so that the openings between the abutments, or between bents of piles or trestles, shall be from the lengths previously agreed upon and for which the chief engineer is prepared to send material without delay. This classification can only apply to *single openings*, because with several spans it will be impossible to include anything general about the necessary piers. Only in exceptional cases will openings over 50 feet be provided for. Larger spans will be subdivided into spans of less than 50 feet by temporary piers wherever possible. In any stream the rate of the current and the amount of drift are important factors in determining the span to be used. The length of time a bridge will be in use is also important, as the river may be at such a stage that one length of span can be used, when if it were at a higher or lower stage an entirely different one would be necessary. On arriving at a bridge that has been destroyed, the first consideration is to get some sort of a line across to connect with the road on the other side. This can frequently be done by making a *deviation* which will carry the roadbed into the river bottom and up the other bank, necessitating only a very short, low bridge. This work is done by the advance party, and a second party follows and constructs the permanent bridge at the grade of the permanent track. Sharp curves on this diversion line should be avoided, since steep grades will be inevitable, and the combination may cause frequent derailments. Before the beams or trusses for the necessary spans can be decided upon, it is necessary to decide upon the location of the piers and abutments. The local conditions as to the banks and the bottom of the stream will, in general, determine the location and kind of abutments and piers that are to be used. In general terms, they will be either of piles, cribs or trestles.

**Cableways.**— In some places an overhead cableway can be used to great advantage in erecting or building a bridge or in transporting supplies across a stream that vehicles cannot cross. There are two classes, the *ordinary cableway* and the *balanced cable crane*. The first form can be quickly rigged if large trees are close to the bank and is very convenient when the load does not have to come in to the very foot of the supports. If towers must be



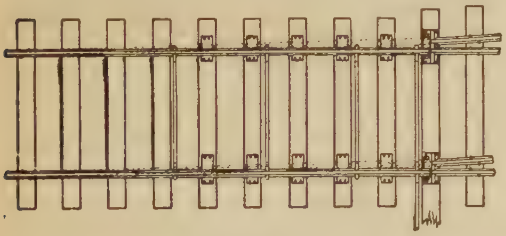


Photograph from Underwood & Underwood, N. Y.

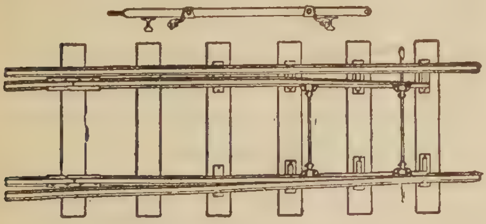
1 Chicago, Milwaukee and Saint Paul 3000 V. D. C. Electrification Train, descending 2 per cent grade on Eastern Slope of the Rockies
2 Chicago, Milwaukee and Saint Paul Electrification. The Pass and Eagle Nest Tunnel in 16-mile canyon

used to support the cable they are difficult to erect and the material is too heavy to carry in a field equipment. A considerably longer span is always necessary than the actual width of the stream and the load must be pulled up hill over one-half of its journey and is only stable at the lowest point in the catenary. The balanced cable crane, on the other hand, can carry loads farther inshore than its points of support; the stress in the cable is constant whatever the position of the load and only sufficient force to overcome friction is required to move the load along the cable. The key to the construction of this cableway is that the length of the cable must be such that *both* counterweights cannot rest on the ground at the same time. The automatic rising and falling of the counterweights as the position of the load on the cableway changes keeps the angles of the cable at the load symmetrical with the action line of gravity and hence the load at any point on the cable.

**Turnouts and Crossovers.**—A turnout is a curved track by means of which cars are moved from one track to another. The special parts of a turnout are the frog and the switch and the guard rails. The term «switch» is frequently applied to the part of a turnout from the point of switch to include the frog. The *switch proper* may be either a stub or a split switch. The latter is the form now generally used. Stub switches are only used on unimportant lines or in yards. A *double turnout* is one where two tracks diverge from the main line, either on the same side or on opposite sides. In a turnout from a curve, the curvature of the turnout for a given frog is different from the curve of turnout from a tangent, and is equal to the curve of the main line plus the curve of the turnout from a tangent for a corresponding frog. The lengths of rail would not be exactly the same on the turnout from a curve as they would be on a turnout from a tangent. On account of this and because of the desirability of having a number of turnouts ready for use at any time, it is best to locate all turnouts on tangents, where practicable. These ready-made turnouts should include all material for the turnout, as shown in bill of material, so that by leaving out an exact number of 30-foot rails the track-laying can be continued; and when the turnout is put in place the opening left will be exactly filled. *Frogs* and *switches* can either be bought outright from equipment companies or can be made in the shops.



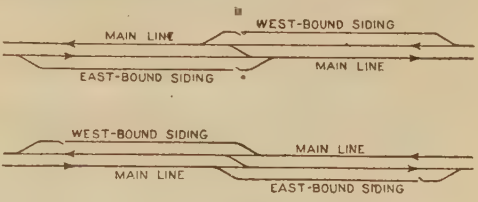
Stub Switch.



Split Switch for Light Rails.

The curves used in laying out turnouts and crossovers are ordinarily arcs of circles and are usually simple curves. It may happen that no frog is at hand, in laying out a double turnout, that will permit a simple curve to be run from the heel of the switch to beyond the farthest frog. In this case, use the frog that will require the sharpest curve as the crotch frog, allowing the flatter curve to lie between the two frogs.

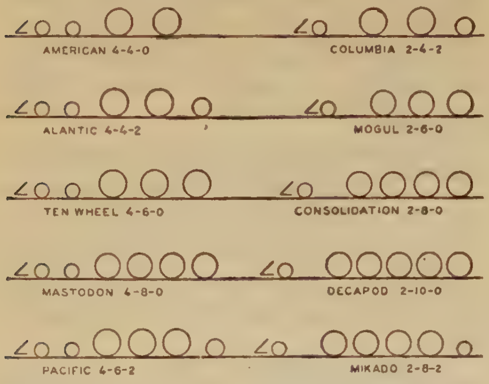
**Facing and Trailing Points.**— These terms apply particularly to the switches of crossovers on a double-track line. A trailing point is one which the trains move over from the point of frog to the point of switch; and a facing point is one which the trains move over from the point of switch to the point of frog. A consideration of the drawing will show the advantage of trailing points, in that if the switch is set wrong the train will run through it, forcing the switch points aside. This will break the switch, but the train will not be damaged. On some roads the policy is to have all main-line switches trailing points and although this requires a little more time in switching cars or going into a siding, it is safer.



Facing and Trailing Points.

**Switch Stands.**—A switch stand is a mechanism by means of which the switch points are moved. The largest kind is more readily seen than the smallest one and would be used in cases where the engineman must be able to note a missetting of the switch. The smallest kind is the kind used in the interlocking plant, where it is next to impossible for a switch to be set wrong and the engineman not be notified of it long before he reaches the switch. The middle type is one that is commonly used in yards. Economy of space and weight might dictate the use of the smaller switch in all cases on a supply road. For *stub switches* these stands should be on the engineman's side approaching in a facing direction. For *split switches* they should be on the side of the turnout.

**Storage Tracks.**— The number and length of these tracks depend upon the importance of the station, the number of depot storehouses that may be located at that point, etc. A study of these items shows that each must be dealt with as it arises and as it is impossible to tell how important a station may become at any future time, available track room will be left for additional loading platforms and storage tracks. In locating the storage tracks, room should be left between the various tracks so that at least one and preferably two lines of wagons can drive in and receive freight from cars on the storage tracks.



Classification of Locomotives by the number and disposition of their wheels: the larger circles represent drivers and the smaller ones truck wheels, the direction of forward motion beng indicated by the cowcatcher.

**Tunnels.**— Few serious difficulties are met in tunneling operations except in subaqueous work, where the nature of the soil is largely unknown, and the work may have to encounter faults in rocks or springs or quicksands in the earth; or the roof formed by a river bed may give way and tons of water may be precipitated into the workings below. Under these conditions work beneath the water has become a new science which has its own special class of workmen, tools and devices adapted practically for its own purposes as described elsewhere in this work under Tunnels and Tunneling (q.v.). See related articles Air Brake; Block Signal System; Bridge Construction, American; Bridge Construction, Modern Methods of; Bridge Designs, Railway; Car Building Industry; Locomotive; Locomotive Industry; Railways, Elevated; Tunnels and Tunneling.

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**RAILWAY LABOR ORGANIZATIONS, or RAILWAY BROTHERHOODS,** labor unions formed by the employees of railways to advance their interests and promote their social, moral and intellectual welfare. The larger and more typical railway labor organizations are distinguished for their generally conservative attitude, their large mutual benefit and insurance funds and their organization of grievance committees for arranging differences between their members and employers and avoiding strikes. As a rule they maintain pleasant relations with employers and have been instrumental in obtaining increased wages and general improvement in the condition of railway labor. The five most prominent organizations are the Grand International Brotherhood of Locomotive Engineers, the Order of Railroad Conductors, the Brotherhood of Locomotive Firemen, the Brotherhood of Railway Trainmen and the Brotherhood of Railroad Telegraphers. These five have the same general form of organization, with the supreme power in the central representative body called the Grand Lodge or Grand Division, meeting in convention every two years, and the executive power vested in a chief executive (grand master or grand president) and an executive board. Their subordinate divisions include locals and section divisions, the latter made up of the employees of one railway line or system. Their provisions for dealing with grievances against employers are as follows: Any member or members having a grievance against an employer are to report the same to their local organization, which, in case the majority vote to sustain the grievance, shall refer it to a local grievance committee. This committee is to deal with the local management, and should no satisfactory settlement be made, refer the grievance to the general grievance committee of the section, who shall confer with the general manager of the railway system. Then, if no adjustment be made, the matter is to be referred to the chief executive of the union who shall make another attempt to adjust the matter with the employers, and, if he fail, he and the general committee shall have power to sanction a strike, provided a strike is agreed upon by two-thirds of the members involved. In some cases a board of adjustment is formed by the chairmen of three or more general committees, in which case the matter is to be referred to this board before going to the chief executive. It will be seen that this arrangement makes a strike difficult to bring about and prevents strikes for trivial causes, yet all of these unions have established large protective or strike funds for the benefit of members when on strike. Another feature of these organizations is the legislative board, organized in each State by representatives from each local for the consideration of questions of legislation affecting their unions; and these boards have power to appoint one or two members to remain at the State capital for securing desired legislation. A ladies' auxiliary is affiliated with each brotherhood. A home is maintained at Highland, Ill., for aged and disabled railroad employees.

**The Five Larger Brotherhoods.**—(1) The Brotherhood of Locomotive Engineers was organized in 1863. The locals have sick and death benefit funds and the Brotherhood has a fund for pensioning widows and children of the deceased. The insurance is under the management of an affiliated organization known as the Locomotive Engineers Mutual Life and Accident Insurance Association. The Brotherhood number 73,800 members in over 600 locals. The official journal is the *Journal of the Brotherhood of Locomotive Engineers*, published monthly. It ranks among the most important and influential labor organizations of the United States and is noted for its conservatism. (2) The Order of Railway Conductors was organized in 1868 as the Conductors' Brotherhood, was threatened with serious difficulty on account of its prohibition of strikes and a rival union started which had a «protective» policy, the Order adopted the same policy, established its «protective» fund, and the two organizations were united under the present name. It has a mutual benefit fund and the strike fund provides for payment to strikers for not over three months. The official journal is the *Railway Conductor*, published monthly. The membership is 49,100 in about 500 locals. (3) The Brotherhood of Locomotive Firemen was organized in 1873, was involved in the great strike of 1877 and seriously crippled; for a time it adopted the policy of «ignoring» strikes, but in 1885 returned to its original policy and methods in dealing with strikes; and a few years later conducted a large strike on the Chicago, Burlington and Quincy Railroad. Strikers are paid for three months or less. The official journal is the *Locomotive Firemen's Magazine*. The membership is 86,800. (4) The Brotherhood of Railroad Trainmen was organized in September 1883 and admits to membership conductors, baggagemen, yardmasters and switchmen besides trainmen. They have a sick and death benefit fund and a strike fund, providing for a payment to strikers for three months or less. It has 126,100 members; its official organ is the *Railroad Trainmen's Journal*. (5) The Order of Railroad Telegraphers was organized in 1886; its membership includes telegraphers, line repairers, levermen and interlockers. Its mutual benefit fund was established in 1898; it has never held quite the same position of importance as the other four brotherhoods, as at the first it grew more slowly because the telegraphers are scattered and it is difficult to get any number together, but since 1900 has grown rapidly. It numbers about 30,000; its official journal is the *Railroad Telegrapher*.

**The Union of All Railway Employees.**— Though these brotherhoods have much in common in organization and purpose there has been rivalry and discord among them, which has proved decidedly detrimental to their best interests. In 1895 an alliance between the five brotherhoods was formed, providing for the formation of a federated board of adjustment for the consideration of grievances and management of strikes. A more centralized federation was organized in 1898, but dissolved in 1900, leaving the agreement of 1895 in force. The first attempt to form a union which should unite in one organization all classes of railway employees was the American Railway Union, organized in the early part of 1893 by Eugene Victor Debs. This union lacked the complicated organization of the older brotherhoods, was radical and aggressive and met with bitter opposition from the older unions. It drew away some of their membership and grew rapidly; before the close of the year it conducted successfully a strike against the Great Northern Railroad. In 1894 it inaugurated a sympathetic strike in behalf of the Pullman Car Company employees, was defeated and shortly afterward the organization dissolved. A later attempt to unite all railway employees is the United Brotherhood of Railway Employees, organized in January 1901, which also resulted in failure.

**Lesser Organizations.**— Of the smaller organizations those which closely resemble the five larger brotherhoods in organization are: (1) The International Brotherhood of Maintenance-of-Way Employees, organized in 1887 as the Brotherhood of Railway Trackmen; its membership includes those employed in track, bridge and building, water supply and fuel departments and signal and interlocking service; it has a mutual benefit department and the same provisions for preventing strikes and dealing with grievances as the other brotherhoods; the official journal is the *Advance Advocate*; the membership is about 10,000. (2) The Switchmen's Union of North America, organized in 1894, admits to membership those engaged in making up and disposing of trains. It has a beneficiary department, membership in which is compulsory for those physically sound. The organization is the same as in other brotherhoods. The membership in 1914 was 9,800; this is less than it would otherwise be because of the fact that the Brotherhood of Railroad Trainmen, an older and more powerful organization, also admits switchmen. The official organ is the *Journal of the Switchmen's Union*. (3) The Brotherhood of Railway Carmen, organized in 1900 by a consolidation of the Brotherhood Car Repairers of North America and the Carmen's Mutual Aid Association. Its membership consists of those who are employed in oiling, repairing, inspecting and cleaning cars; it is a comparatively unimportant organization. (4) The National Railways Clerks' Association, organized in 1901, had in 1914 a membership of 5,000 in about 50 locals; it publishes the *Official Journal of the N. R. C. A.* (5) The International Association of Car Workers, organized in 1901, includes in its membership those employed in the construction and maintenance of all cars; it has no benefit department, but the arrangement for dealing with grievances and strikes by local and general grievance committees; its declaration of principles is conservative, including opposition to prison contract labor and a declaration in favor of reduction of hours of work and compulsory education. Its official journal is the *Car Worker*; its membership is over 20,000.

Other railway organizations are the Mechanical Trackmen, with 4,000 members; the Railroad Freight Handlers, with 3,000 members; Railroad Signalmen, with 11,000 members; Railroad Station Agents, with 11,000 members; Railroad Station Employees, with 4,300 members; Railway Express Messengers, and Railway Expressmen, and the Street and Electric Railway Employees, with 54,500. According to the *Quarterly Journal of Economics* there are about 600,000 members enrolled in the several railroad labor organizations. Consult *Review of Reviews* (May 1917); *Quarterly Journal of Economics* (passim) and publications of the Bureau of Labor Statistics of the United States Department of Labor. Consult also files of the official brotherhood journals mentioned above.

**RAILWAY SHOPS AND MACHINERY.** Railway buildings and machinery are required for the maintenance and repair of locomotives and cars and for their cleaning, inspection and storage. Few railways build locomotives on a large scale, although their engineers design them. Many railways build freight cars and sometimes passenger cars, but both cars and locomotives are built mainly by private firms. See RAILWAY CARS; LOCOMOTIVE.

Repair work, however, must be done by every railway. Usually there is one main shop plant where engines are sent for extensive repair or rebuilding. There may be more than one, but the tendency is to concentrate the heaviest work, this being economical in time and cost and in machinery investment. Important division plants will have shops for general repairs, and at the ends of all operating divisions there will be facilities for such light repairs as are needed to keep the equipment in service. Economic use of engines and cars requires that they be kept in good condition, so that they may give the greatest mileage and service before they need be sent to the shops for extensive overhauling and repair. The plan and facilities at any shop plant will vary with its capacity, its site, its special purposes and the ideas of the designers. Provision must be made for future enlargement.

A large repair plant for locomotives will include a machine shop, erecting shop, boiler shop, tank — or tender — and sheet iron shop, iron foundry, pattern store and supply storehouse. The first five of these may be separate or grouped in two or more large buildings. The erecting shop, where the engines stand while being dismantled, repaired and assembled, may have several short transverse tracks for one or two engines each, or a few widely-spaced longitudinal tracks. To avoid blocking these latter, the engines may be lifted from their wheels and placed on the floor between or outside of the tracks. Pits in the tracks enable workmen to get under the engines.

Overhead traveling cranes shift the locomotives. With the longitudinal plan, two cranes of 100 to 150 tons capacity must be used, one at each end of the engine. With the transverse plan one 200 to 250-ton crane can do the work. Similar but lighter cranes at a lower elevation may handle the various parts and materials. Less expensive arrangements for division shops, to permit of removing the wheels, are power-operated screw jacks which lift the engine by beams under its ends, or drop pits beneath the tracks for small carrying hydraulic jacks which take the wheels from under the engines.

Longitudinal tracks extend through the building to yard connections, but the short transverse tracks extend usually through one side to the pit of a power-operated transfer table which has one track and travels laterally so as to connect this with any one of the tracks leading to the pit. Usually two buildings are on opposite sides of the transfer table, each with room for an engine to stand between it and the pit.

A large repair plant for car equipment will include a coach or passenger-car repair and erecting shop, coach paint shop, coach truck shop, freight-car repair shop, cabinet shop, woodworking shop and outdoor repair tracks. Also a lumber yard and dry kiln. A blacksmith shop and machine shop are required, but in a combination plant these — and the foundry — may serve both the locomotive and car shops. Brass and steel castings are generally purchased.

Passenger car shops generally have short transverse tracks served by an outside transfer table, running between two buildings. Freight car repair work of the heavier class may be done in a building equipped with overhead cranes, but much ordinary repair is done on open tracks. These are arranged in pairs, the alternate wide spaces admitting intermediate tracks for trucks carrying materials. The repair yard has pipes supplying water for refrigerator cars and compressed air for testing brakes and operating tools.

Shop buildings are usually one-story structures, except that in the machine shop the lighter work may be done on a mezzanine floor at the side. Storehouses and pattern stores are usually several stories high. Modern buildings are largely of steel frame or reinforced-concrete, with large window areas of steel sash, and with monitor or saw-tooth roofs for light and ventilation. A power-house furnishes steam heat, water, compressed air and electric current for light and power, although electric supply is often obtained from an outside source. Machine tools and other appliances are operated largely by electric motors. Auxiliary to the plant will be its water supply and sewerage, heat, light and power, sanitation and locker and wash-rooms for the workmen. Handling material between the several shops and departments may be effected by motor trucks, narrow gauge railways or small tractors hauling trailers on paved roadways.

Locomotives operate over fixed divisions, between certain points, the distance averaging 100 miles. At each end must be an engine terminal with facilities for cleaning the fire, supplying coal and water, inspecting and cleaning the engine and making light repairs, and turning it for the return trip. Coal and water supply must be provided also at points along the division.

An engine which has just brought in a train and finished its trip goes to the engine terminal, where it takes water and coal if necessary and then has its fire cleaned or dropped at an ashpit. If not at once sent to an outbound track it is moved to the engine-house to be inspected and cleaned and given light repairs, especially those reported by the enginemen. Inspection is done sometimes at a pit in advance of the ashpit. The engine is held in the house until assigned for the return trip, when a new fire is lighted. Where no repairs are necessary, engines ready for service may be stored on outdoor parking tracks arranged radially or parallel. An engine going out to its train usually takes coal, water and sand just before leaving, so that facilities must be accessible to both inbound and outbound engines. Other facilities include a machine shop, storehouse, sand drier and oil-house. Also a rest room for the men, with quarters for engine crews whose homes are elsewhere.

Engine-houses on American railways are usually of the «roundhouse» type, being segmental in plan, with radial tracks converging upon a turntable by which an engine can be transferred from any radial track to the approach track connecting the turntable with the yard tracks. Rectangular houses are used in some cases, with parallel tracks connected directly to an approach track or served by a transfer table traveling at right angles to them. A special design has short diagonal tracks opening from a track extending along one side of the building. A turntable is like a revolving bridge and serves both to shift and turn locomotives. If this is not provided there must be a Y-track, forming a triangle, for turning engines and cars. In Europe, engine-houses are generally rectangular with tracks parallel or radiating from a turntable inside the building. To provide against blockades there should be more than one track leading to the turntable.

Roundhouses rarely form a complete circle. They are of brick or concrete, with low roof, and have either double swinging doors or flexible steel doors that roll up at the top. To carry off the smoke, especially when new fires are being started, each engine stands with its smokestack under a smokejack or hood, which extends through the roof. To avoid a nuisance, the smokejacks may be connected to a flue served by an exhaust fan and led to a tall chimney or to a series of water-filled trays through which the gases rise and are discharged to the chimney while soot and dirt are retained. In such cases the smokestacks are lowered into contact with the engine smokestacks. A pit between the rails of each track permits men to go under the engines to inspect and repair them. Frequently a drop pit is provided for a truck with jack to take an axle and pair of wheels from under the engine. The machine shop is usually an annex to the engine-house and sometimes one of the radial tracks extends into this shop.

Water stations comprise mainly a pumping plant with elevated tank which may supply the engines directly by spouts or may distribute a gravity supply to water columns. These are tall stands having a horizontal pipe at the top, the latter capable of being swung across the tender of an engine and discharging into the tank. When not in use this pipe lies parallel with the tracks. Water that is hard or of scale-producing quality may be treated in a chemical plant before going to the elevated tank, this being far preferable to the practice of putting chemicals in the tender or boiler. Track tanks for supplying water to moving locomotives were invented by John Ramsbottom, of England, in 1861 and are used on a number of main lines in the United States. The tank is a shallow pan about 20 to 24 inches wide and seven inches deep, laid upon the ties for a distance of 1,200 to 1,500 feet and provided with steam and circulating pipes to prevent freezing. A hinged pipe on the tender is lowered so that its mouth or scoop dips below the surface. The speed of the train causes the water to be driven up this pipe, which ends in an elbow discharging the water downward into the tender tank.

Coal is delivered to the engine tenders in various ways. Buggies or cars loaded by hand may be wheeled over a platform alongside the coaling track and above the level of the top of the tender, or they may be wheeled on a bridge spanning the tracks and having hinged spouts to be lowered to the tenders. Locomotive cranes with grab buckets may deliver coal from the stock pile to the tender. The most general method is to place the coal in elevated bins fitted with hinged spouts, the bin being either parallel with or across the tracks. For loading the bins, coal cars may be pushed up an incline by a locomotive or pulled up a steeper incline by a cable hoist. In many cases the cars dump the coal into a hopper beneath the track, whence it is fed to an intermittent vertical bucket elevator or a continuous conveyor which delivers it into the bin.

Where oil fuel is used, special tanks, pipes and oil columns are required to supply the tender tanks. Economy demands that fuel delivered to each engine should be weighed or measured and recorded, and special automatic apparatus for this purpose is in use.

Ashpits where locomotives have their fires cleaned consist frequently of two parallel shallow pits — under the engine tracks — with a deeper pit between them for a car into which the ashes are shoveled or sluiced. The ashes may be dropped directly into small steel cars standing in deeper pits under the engine tracks, these being pulled out on an incline at the end or side of the pit; or with a pit transverse to the tracks the engines may drop the ashes into fixed steel hoppers from which they are discharged at convenient times into a small car running on the floor of the pit. This car is hoisted out and emptied by a crane at one end of the pit. Another plan is to put the engine tracks over the sides of a Y-shaped pit, the ashes sliding down into the deep part, which is full of water. The pit is cleaned by a grab bucket handled by a gantry or locomotive crane.

Cleaning passenger cars is provided for at terminals on groups of tracks usually connected at one end only, but sometimes at both ends. Wide spacing affords room for operations, and permanent staging may support the cleaners' platforms. The yard is paved and drained. Pipes with hose connections at intervals supply water for washing, steam for heating, compressed air for charging brakes; and sometimes there are pipes for vacuum cleaners, as well as electric connections for lighting cars and charging batteries.

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**RAILWAY SIGNALS.** See BLOCK SIGNAL SYSTEM.

**RAILWAY SURVEYING.** See SURVEYING.

**RAILWAY TRANSPORTATION IN THE UNITED STATES.** See UNITED STATES, RAILWAY TRANSPORTATION.

**RAILWAYS, American Street.** See AMERICAN STREET RAILWAYS.

**RAILWAYS, Elevated.** Elevated railways presented one of the first potent factors for the solution of the problem of adequate transportation for passengers between points in great cities. The street railway was an earlier factor, but it met the growing inconvenience of congested streets in only a partial degree, affording but temporary relief. In New York, which city possesses the most extensive system of elevated railways in the world, without taking account of the large system in Brooklyn, now a part of the greater city, two means of relieving the streets of some of the burden of passenger traffic began to be considered as long ago as 1860. Two possible solutions presented themselves, one being to carry it underground through tunnels, and the other to carry it over elevated structures. The former met with more favor at the outset, but the first underground project undertaken was speedily abandoned. Considerable ridicule was expended upon the other idea, but in spite of it an elevated railway, with a single track, was built from Battery place through Greenwich street and Ninth avenue to 30th street in 1866 and 1867, and opened to travel on 2 July 1867. It was operated by means of a cable for a short time, when steam locomotives were substituted as motive power. It did not gain popularity as an aid to local travel, and its lack of success caused it to pass into the hands of the sheriff in foreclosure proceedings, and it was sold for the benefit of creditors in 1871.

The West Side Elevated Railroad Company, as the corporation which built and operated this pioneer elevated line was named, was succeeded by the New York Elevated Railroad Company, organized 3 Jan. 1872, under a charter granted by the State legislature the year before. A few months later, on 17 June, the Gilbert Elevated Railroad Company, which obtained a charter earlier in that year, was organized to build a line projected by Dr. Rufus H. Gilbert, and which was planned to be a pneumatic tube railway, suspended from lofty arches. For some reason the pneumatic tube idea was abandoned, sustaining at first a modification which, by cutting off the upper half of the tube, made it a mere trough wherein the cars were to run, and it was decided to build a simple elevated railway. Meanwhile there had been not only lack of encouragement for this sort of enterprise, the West Side experiment not having succeeded yet in overcoming popular prejudice, but there was antagonism on the part of property owners who would be affected by the construction of such railways, and there was friction also between the two existing companies. Litigation assisted to complicate and delay matters.

This was the condition of affairs when, in 1875, the State legislature passed what is known as the Husted Act, which provided for a commission to decide as to the necessity for an elevated railway system in New York City, and to determine proper routes. Under this act a commission was appointed by the mayor of the city on 1 July 1875, and after a number of hearings given to all who favored or opposed such a system the decision arrived at was a favorable one. The commissioners announced on 11 December that their work was ended, the routes which they selected being four in number and including respectively Ninth, Sixth, Third and Second avenues. The work of building the lines was assigned to the two companies then existing, and both companies entered at once upon active construction and into equally active litigation, while each was under the necessity of defending the constitutionality of its charter against the attack of citizens, who were determinedly opposed to both. The New York Elevated had extended its line from the South Ferry to 61st street and Ninth avenue in 1876, and had opened it for travel to 59th street. About this time the enterprise enlisted the interest of Cyrus W. Field, who secured a controlling interest in the company in the spring of 1877. The same vigor and determination that marked his connection with the first Atlantic Telegraph Cable was displayed here, and much of the credit for the eventual success which attended the new departure in urban passenger traffic was accorded to him.

Rivalry between the two existing companies had created much business for the courts in the meantime; the constitutionality of their charters was questioned; and there were injunctions and counter-injunctions. The Court of Appeals finally was asked to pass upon the constitutionality of the charters, and it sustained them both by a decision which was unanimous. All injunctions were dissolved and work was pushed forward, not only on the pioneer West Side line, but also upon the Sixth avenue line, which had passed from Dr. Gilbert's control and was known now as the Metropolitan Elevated Road. This line, extending from Rector street to 59th street, was opened 5 June 1878. During 1879 the New York Elevated opened its West Side line to 83d street and constructed its Third avenue line which was opened to 129th street the same year. By this time the new means of travel within the city had commended itself to popular favor to such a degree that the permanency of the enterprise was assured. The Manhattan Elevated Railway Company, organized under a Rapid Transit Act, passed in 1875, and chartered on 29 December of that year, took a lease of the roads owned by both the New York Elevated and the Metropolitan, the lease dating from 1 Feb. 1879. From that time the entire elevated system of New York City, of course not including the Brooklyn system, was known as the Manhattan Elevated Railway. In 1880 the Ninth avenue line was opened to 155th street; a spur from Chatham square created an additional terminus for the Third avenue line at city hall; a branch of the same line at 34th street afforded connection with the Second avenue line, which it crosses below grade, and gave access to the Long Island City Ferry from both lines; and a branch from the Third avenue line at 42d street connected with the Grand Central Railway Station.

Financial difficulties which had repeatedly beset the companies which had undertaken the development of this already gigantic project were of such magnitude in 1881 that the Manhattan went into the hands of receivers on 14 July. After the difficulties had been straightened out and a reorganization of the company had been effected, each year was marked by extension and improvement of the service until the system became, in 1904, an elevated railway consisting of four main lines with branches, its total trackage being 117.14 miles, divided as follows: Main lines and branches, two tracks (each 37.68 miles), 75.36 miles; third track, used for express trains, 15.19 miles; sidings, 26.59 miles. The southern terminus of all the lines was at South Ferry. The Sixth and Ninth avenue lines ran through Battery Park to Greenwich street, diverging at Morris street, whence the Sixth avenue line extended through Church street to Murray street, through which it reached West Broadway; it traversed this thoroughfare to 3d street, passed through 3d street to Sixth avenue, which it followed to its terminus at 59th street, the station being at 58th. A branch running westward through 53d street connected it with the Ninth avenue line. From Morris street the Ninth avenue line ran through Greenwich street to Ninth avenue and through that avenue to 110th street, where a double curve on a very high structure carried it into Eighth avenue, which it followed to the terminus at 155th street. The Second and Third avenue lines were one from South Ferry to Chatham square. After leaving the ferry they made a sharp turn into Front street; thence through Coenties slip and Hanover square they entered Pearl street, which they followed to and through the New Bowery to Chatham square. They diverged here, the Third avenue line continuing through the Bowery and Third avenue to the Harlem River. At 34th street passengers desiring to reach the Long Island Ferry transferred to a «shuttle» train; and at 42d street another «shuttle» train conveyed transfer passengers to the Grand Central station. Trains from city hall followed the same line, and passengers were transferred at Chatham square to the Second avenue line if they desired it, as well as at the two other transfer stations mentioned. From 129th street at the Harlem River the Third avenue line continued northward, crossing the river by a fine bridge, open also to foot passengers. North of the river the line ran over a private right of way to Third avenue at East 148th street, whence it followed the avenue to Pelham avenue in Fordham, opposite the entrance to Saint John's College. Pelham avenue was practically the end of the line, but from this point there was an extension to the Botanical Gardens in Bronx Park, about a half mile farther north. The Second avenue line, after leaving Chatham square, passed through Division, Allen and East 23d streets to Second avenue, through which it continued to the terminus at 129th street and the Harlem River, where passengers going further north transferred to the Third avenue line. Transfers were made at 34th street to either the Long Island Ferry or the Third avenue line via the branch operated on that street. Down-town passengers on either the East or West Side were transferred at South Ferry to up-town trains on the other side. There was also a system of transfers to the surface lines at various points, the transfer costing the passenger three cents extra.

Until 1901 steam locomotives were relied upon entirely for motive power. The matter of substituting electricity began to be agitated in 1885. The first experiments were made with a motor invented by Leo Daft which was kept in service intermittently on the Ninth avenue line, between 14th and 50th streets, from 27 Aug. 1885, until 19 October, when a series of carefully recorded daily runs was made, continuing, except on Sundays and election day, until 22 December. The object of this series of runs was to ascertain measurement of coal consumed, etc. The Daft motor derived its power from an insulated third rail. It did not commend itself to the management of the road, and the inventor was unable to make such improvement in it as to so secure its adoption. During the latter part of 1886 F. J. Springer operated an electric car successfully on the 34th street branch; and in 1893 an electric locomotive designed by J. B. Enty which was operated by current derived from storage battery, or from a third rail, as might be found necessary, was tried on the same branch with excellent results, but neither of these inventions was regarded as wholly satisfactory. While New York led in adopting elevated railways, it permitted Liverpool to be the first in adopting electricity as motive power, the Liverpool Overhead Railway, completed in 1893, adopting it at the outset. In the same year the Intermural Railway, a feature of the Columbian Exposition at Chicago, made successful use of electricity in the operation of its cars. It was not until the spring of 1899 that the Manhattan Railway decided to use electricity, and the change from steam as motive power was made gradually, the first trains operated by electricity being run over the Third avenue line in 1901. It had already come into use on the elevated railways in Brooklyn. The number of passengers carried over the system in 1922 aggregated 348,517,216. The system went under lease to a corporation named the Interborough Railway Company, chartered 6 May 1902.

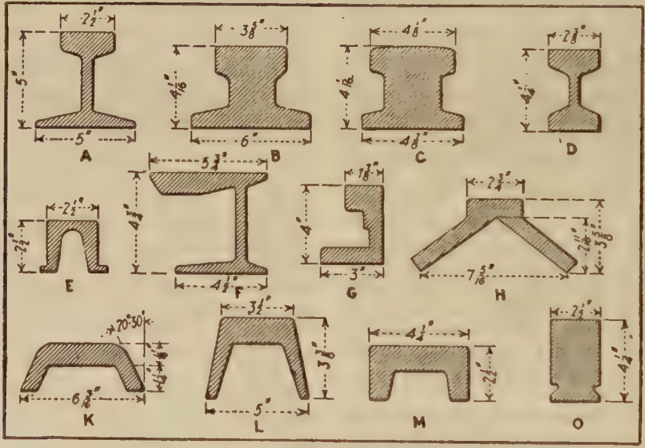
Brooklyn, one of the boroughs of New York City, also has an extensive elevated railway system which, like that in Manhattan and the Bronx, grew out of independent enterprises which finally consolidated. The first company was chartered 26 May 1874, under the somewhat peculiar name of the Brooklyn Elevated Silent-Safety Railway, afterward changed to the Brooklyn Elevated Railway. It encountered vicissitudes, chiefly financial, and was reorganized 29 May 1884. Other companies were chartered prior to the date last mentioned, and several later. The Brooklyn Union Elevated Railroad was chartered 30 Jan. 1899, to take over the properties of the Brooklyn Elevated, the Union Elevated and the Seaside and Brooklyn Bridge Elevated railroads. On 7 July, in the same year, the Kings County Elevated Railroad was chartered to succeed an earlier company of similar name. This company was reorganized in July 1899, absorbing the Fulton Elevated Railway. Early in May 1900 this company acquired the Sea View Railroad, and subsequently it and its acquisitions were merged in the Brooklyn Union Railroad, which was a part of the entire system of elevated and surface lines operated by the Brooklyn Rapid Transit Corporation. The first elevated line in Brooklyn was opened in May 1885. The various lines comprised in the system had termini at Fulton Ferry, the New York and Brooklyn Bridge, the Broadway Ferry, the Williamsburgh Bridge, Ridgewood, East New York, Woodhaven (where trains followed the New York and Rockaway Beach Railroad to Rockaway), and at 65th street, Bay Ridge. All trains to and from the bridge either traversed the full length of the bridge to New York, or transferred there to the bridge trains, which were operated formerly by the bridge authorities. The same conditions exist in regard to trains arriving at or leaving the Williamsburgh bridge. The total length of all the elevated lines in 1904 in Brooklyn was 28.70 miles, with a total trackage of 67.82 miles. Electricity was introduced as motive power in July 1900.

Chicago opened its first elevated railway in October 1893, the pioneer company being the Lake Street Elevated Railway, chartered 24

Aug. 1892. Other companies were subsequently organized, and there was, as in New York and Brooklyn, a series of reorganizations and consolidations which gave to the city a large and convenient system, operated by electricity.

Boston also had a fine system, which from its opening was operated by electricity. The building of an elevated railway system was discussed in Boston as early as 1876, but popular opposition and business interests combined successfully for years to defeat any action by the State legislature, which alone was competent to give the necessary authority. The Boston Elevated Railway Company obtained a charter, finally, in 1894, and the road, which was opened 10 June 1901, was constructed in a little over two years. Its total length was about six and two-thirds miles, and the total trackage, including sidings, was something over 16 miles.

The total of 308.94 miles of elevated track in 1902 has gradually increased to 429.67 miles in 1918, electricity being the motive power, with the exception of about 16 miles operated by gasoline motors. The present car equipment of the elevated roads in operation is relatively large, averaging about 12 cars per mile of track, and has kept pace in all general improvements with the surface and subway equipment. As a rule the car body is built throughout with structural steel and pressed steel shapes, and is designed with continuous structural steel centre sills and plate side girders. The floor and side framing is designed to include cross-bearers which transfer the floor load to the side trusses. The entire car body, exterior and interior, is made fireproof and is thoroughly insulated against extremes of heat and cold, noise and the effect of vibration. In the latest pattern, an important feature of the underframing is contained in the body bolsters. These are made of two soft-steel plates with a cast steel separator in the centre. The steel casting, in addition to serving as a separator for the top and bottom plates, is designed to form a housing for the draft springs by extending it beyond the bolsters toward the end of the car body. Each bolster is equipped with a roller side bearing.



Different Third-rail Sections.

The recent introduction of field control with the interpole motors has become a most positive power saver. This is simply a revival of the old control system used in some of the earliest railway motors. The early double-reduction motor made the most extensive use of this, since the control was entirely by commutating the field and employed no external resistance at all. It was used to a greater or less degree in these motors and in some of the single-reduction motors as well. This system worked with marked success in its application on the locomotives of the New York, New Haven and Hartford Railroad. These had single-phase motors of the series-compensated type, which permitted a wide range of variation in the field strength without impairment of the commutation.

In elevated and subway construction the great advantage of heavier rails lies in their increased conductance which tends to render unnecessary a paralleling feeder system. The length of rail used affects the labor of handling and the number of bonds necessary to a large extent. The present practice of bonding presents no particular difficulty where third rails are properly supported and anchored. There has been much experimental work conducted with new and original sections for use as third rail. The chief considerations which led to these were (1) to produce a section which had a greater contact surface in proportion to its weight than the ordinary T-rail, thus giving a greater wearing surface and longer life, and (2) to obtain a section which could be more easily supported and which would provide greater facility for bonding, anchoring, insulating, etc., than the ordinary T-rail. The drawing shows a number of third-rail sections. The section shown at A is the 80-pound standard T-rail section commonly used. B is a special section used by the Long Island Railroad. C is a similar section used by the New York Municipal Railway. All of these are used for over-running contact. The section shown at D is that used by the New York Central Railroad on rails with under-running contact. It was designed to provide a better support for this type of construction than was available with the standard T-section. Section E is that of the Philadelphia and Western Railway, which was originally designed as an under-running rail, but has since been inverted, a change which was found necessary to meet local conditions. The remaining sections shown, F, G, H, K, L, M, O, are special types for over-running third rail, and special shapes brought out to provide a more satisfactory means for supporting these sections and also for supporting a protective covering.

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**RAILWAYS, Government Control of.** The government's obligation to maintain an equitable relationship between the public and carriers is a continuing one, although the problem has assumed a different form from time to time and is merged to some extent with the problems of the public control of corporations. In enacting the Sherman Anti-trust Law, Congress had only industrial combinations in view; but the rulings of the Supreme Court have made the law an important part of the legislation for the regulation of railroads. As a measure for the control of inter-railway relations the law is faulty in that it makes practically all co-operative action on the part of rival carriers illegal. While the Sherman Act and subsequent legislation have fixed the general scope of the governmental regulation of transportation, the efficiency of governmental control has been determined by the actions of the courts in interpreting the law and in exercising their equity powers.

To understand the fine distinction between *government control of railroads* and *government ownership of railroads,* a study or examination of the *Railroad Control Law* will greatly assist. This law, enacted in March 1918, authorized the President to contract with the companies for the payment of an annual sum not exceeding a specified maximum, to be determined for each road by the average annual railway operating income during the three years ending 30 June 1917. The government agreed to pay all taxes, State or Federal, assessed during the period of Federal control, except the excess profits tax and the corporate income tax. These latter were to be paid by the company out of the payments made to it by the government. With respect to the effect of government control on State taxation of the railroads, the act expressly provided that it should not affect «existing laws or powers of the States in relation to taxation.» The President was authorized to initiate rates, but they were required to be «reasonable and just» and they were subject to review by the Interstate Commerce Commission. The act directed the commission to consider when reviewing the President's rates the circumstances caused by war conditions and the need for additional railroad revenues. Federal control was to continue during the war and not exceeding one year and nine months after the ratification of the treaty of peace. Congress authorized the government to take control of street and interurban railroads necessary for the transportation of ship yard employees.

Among the most important of the needs of the situation is the compulsory Federal incorporation of railroad carriers. So long as Congress confined itself to restrictive legislation of railroads as *common carriers,* it was not material whether they were Federal or State corporations, or indeed corporations at all. The working and operation of the physical properties and their relations as carriers to the public were the only matters of concern, and their corporate functions were not substantially affected. If only restrictive and oppressive legislation were intended now, Federal incorporation would not be necessary. But the time seems to have arrived for a comprehensive legislative plan for developing and sustaining necessary railroad transportation, or, in other words, for *constructive legislation.* The present system of regulation now imposes on the Interstate Commerce Commission, executive, judicial and legislative functions of great difficulty and importance, and all plans thus far suggested contemplate enormous additions to such functions. This commission should be relieved of its executive duties, for which such a body is least suited.

It is obvious that executive and administrative functions cannot be efficiently exercised by boards, commissions or committees. This was demonstrated during the European War. The larger the board or commission, the more cumbersome or difficult becomes the task. Experience has demonstrated the necessity for a national government officer to meet emergencies resulting from exceptional congestion in traffic or through blockades of transportation, by quickly mobilizing the transportation resources, and by the arbitrary diversion, if need be, of traffic from lines which cannot handle it to lines which can, and by other instant and heroic methods. It is generally conceded that there should be a *Transportation Department* of the government with a Cabinet member at its head in order that railroad business might be properly represented and have a «friend at court.» In the matter of service, a Cabinet officer by calling in railroad executives and through informal discussions could bring about changes in train service, schedules and other things desired by the public, which if taken up with the elaborate formality and procedure inevitable in cases of a commission or similar body would not be accomplished for weeks or months. A single executive representing the government in all these important matters of service could get into instant touch with the railroad executives and secure action with respect to these matters of such vital importance to the public very much quicker than would be possible by the slow-moving procedure of any board or commission. The secretary would not be hemmed about by any judicial conceptions and matters of importance could be promptly brought before the Interstate Commerce Commission by formal complaint. The largest single industry in the United States, next to agriculture, and certainly there is none more vital to the very life of the nation, has, it will be seen, no department, bureau, agency or officer of any kind or description whose duty it is to look after its interests, to defend it or to say a word for justice in its behalf. The Interstate Commerce Commission was conceived in hostility to it and the Interstate Commerce Act was designed to repress, regulate and punish it. The figures given out by the United States Railroad Administration, giving the results of government control during the European War, show that 5,377,468 soldiers were transported in 14 months on American railroads, 7,173 special trains, carrying 95,246 cars, being operated. The Overman Act, approved 21 March 1918, provided that the Interstate Commerce Commission should ascertain and certify to the President the average annual railway operating income to be used by the President in making agreements for compensation for the use of the transportation systems of the country. In case the amount of compensation was not adjusted, claims could be submitted to boards of referees appointed by the commission, and the finding of such boards would be a maximum of compensation which would be paid to the carriers. See RAILWAYS, GOVERNMENT OWNERSHIP OF.

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**RAILWAYS, Government Ownership of.** After the World War began in Europe, conditions made it impossible to compile complete statistics regarding the railroads of the world. However, with the knowledge we have regarding the extent of government ownership before the war, and regarding the changes in the relations between the railways and the state which we know have occurred since the war began, it is possible to give an approximately correct idea of the present extent of government ownership of railroads. For several years before the war the *Archiv für Eisenbahnwesen,* the official publication of the Prussian Ministry of Public Works, issued annually a compilation showing the mileage of railways in the various countries which was owned by the governments and by companies. In the year 1913, according to this authority, the total railway mileage of the globe was 690,133 miles. Of this, 464,421 miles, or 67 per cent, was owned by companies, while 225,712 miles, or 33 per cent, was owned by governments. Most —or to be specific, 256,823 miles — of the mileage owned by companies was in the United States. Even outside of America, however, the mileage owned by companies was 207,598 miles, or only about 18,000 miles less than the total mileage owned by governments.

It is often asserted in the United States that government ownership of railroads has become the policy of almost all the world except the United States. The foregoing statistics indicate that this is not the case, nor does a further analysis of the statistics of the world's railways lend support to this view. Before the war out of 75 countries which had railways, 40 had more mileage that was owned by companies than by the state, while 35 had more mileage that was owned by the state than by companies. In only seven of these countries were there no privately owned railways, while in 26 there were no government-owned railways. In some of the leading countries of the world private ownership preponderated while in other leading countries government ownership preponderated. In the United States and Great Britain all the railways were privately owned, and in France, Belgium, Spain, Sweden, Canada and Argentina private ownership preponderated. In Germany, Austria-Hungary, Russia, Italy, Mexico, British India, Japan and Australia government ownership preponderated.

Since 1914, when the war began in Europe, there probably has been a greater increase in the mileage owned by governments than in that owned by companies. For example, in 1913 Canada had 27,687 miles of railway, of which only 1,781 miles was owned by the government. Some railways whose bonds the Canadian government had guaranteed, fell into financial difficulties, however, and the government took them over, with the result that of the now existing 40,000 miles in Canada about 13,500 miles are owned by the government. The extension of government operation has been even greater than the extension of government ownership. All the private railways of France, Great Britain and the United States were taken over by the governments during the war, and, therefore, during the war about five-sixths of all the railway mileage of the globe was state-operated. When, on their entrance into the World War, the governments of France, Great Britain and the United States took control of the railways it was freely predicted that in none of these countries would they ever be returned to private operation. This prediction was later shown to have been incorrect. The French seem disposed to return to private operation the railways owned by companies as soon as practicable. The experience of the French public with state operation of the Western Railway, which was taken over in 1908, has created sentiment against government management. The British Parliament passed a bill providing for a continuance of government operation for two years. At one time nationalization of the British railways seemed inevitable, but after the signing of the armistice strong opposition to it sprang up. The experiment of government operation in the United States resulted in the development of an overwhelming sentiment against that policy, and President Wilson announced that the railroads would be returned to operation by the companies at the end of the year 1919. They were returned on 1 March 1920.

Therefore, in spite of the extent to which government operation was adopted during the war, it appears probable that the war will not result in greatly changing the proportion of the railways of the world owned by governments, and that the question of government versus private ownership and management will continue to attract much public attention and be widely discussed for many years. Recently there was started in the United States a movement to have the government acquire the railroads, but, instead of managing them itself, turn them over to the management of a board of directors of 15 members, five to be appointed by the President of the United States, five by the railway officers and five by the railway employees. Under this plan any surplus over fixed charges earned by the railroads would be divided equally between the employees and the government, while any deficit incurred would be paid by the public. While much energy has been put into the propaganda for this plan, and it has been endorsed by most of the organizations of railroad employees, it has not met with much public favor. It seems probable that if the railroads of the United States are ever acquired by the public they will be managed by the government. One of the principal arguments which have been advanced in favor of government ownership in the United States as well as elsewhere is that an economy would be effected by reducing the return on capital which would have to be paid. The spokesmen of the railroad companies claim that they must be allowed to earn approximately 6 per cent upon the value of their properties in order to pay a return upon the existing investment and raise sufficient new capital to provide needed additional facilities. As a matter of fact, the return paid by the companies upon their outstanding capitalization never has exceeded 5½ per cent in any year, but they have at times earned more, when most of their surplus earnings have been invested in the properties. It has been claimed that whereas the companies insist upon being allowed to earn 6 per cent the government would not have to pay more than 3½ or 4 per cent upon its bonds. It is pointed out in reply, however, that in order to raise money to play its part in the Great War the government finally was obliged to pay interest at the rate of 4¾ per cent; that in order to acquire the railroads it would have to issue at least $15,000,000,000 to $20,000,000,000 in bonds, and that it could not market such a vast amount of bonds unless it paid 5 per cent or more interest on them. Therefore, it is contended, the saving in the capital charge under government ownership would be small.

Another argument which has been made for government ownership is that under that policy large economies would be effected by consolidating the railways, eliminating all competition, together with the officers and the employees kept on the pay rolls to carry on competitive activities, and operating the railways as a single system. Before government operation was adopted the operating economies which advocates of government ownership claimed could be made in the United States in these and other ways were estimated at from $400,000,000 to $1,000,000,000 a year. The opponents of government ownersnip claimed that the wastes of competition and the economies which could be effected by government management of the railroads as a single system were enormously exaggerated. They also claimed that while some economies undoubtedly could and would be effected under government operation, the destruction of individual initiative and enterprise, and the introduction of political influences, would result in increases of expenses which would much more than offset any economies that might be made. They contended that comparisons between the state managed and the privately managed railways of the world showed that the latter were usually more economically managed than the former. The actual experience of different countries with government management of railroads before the war yielded widely differing results. The evidence indicated that the state railways of Prussia, of Japan and of British India were quite efficiently operated. Comparisons between their operating results and those of the most efficiently operated private railways of the world, such as those of France, Canada and the United States, indicated that the most efficiently managed state railways probably were not quite as economically run as, and did not give any better service than, the most efficiently managed private railways; but when, as nearly as was practicable, allowance was made for differences of condition, the impartial student was obliged to admit that the difference in efficiency indicated was not very great. An outstanding feature of the results of government operation was that all the state railways, the results of whose operation indicated an efficiency in management approaching the efficiency of management indicated by the results of the leading privately owned railways of the world, were owned and managed by autocratic governments. The opponents of government ownership in such countries as the United States and Great Britain pointed out that under the autocratic governments of Prussia, Japan and British India, the railroad employees were practically without political influence and were not even allowed to form labor organizations. They claimed that in countries having democratic governments, where railroad employees constitute a large part of the voters and where they are allowed to form powerful labor unions, government management almost invariably has been relatively inefficient and uneconomical. They made the inference that while state management may be successful when conducted by an autocratic government it cannot be made successful in a country having democratic institutions. They also cited statistics to show that in countries such as France and Canada, where there are both government managed and privately managed railways, the former are less economically operated than the latter, and that usually when railways have been transferred from private to government management, as in the cases of the Western Railway of France, the Northern Railway of Austria and the railways of Italy and Switzerland, there usually has followed a marked increase of operating expenses.

Probably the most striking example of an increase in railroad expenses following a transfer from private to government management is that which occurred in the United States during the World War. In 1918 the operating expenses of the railways of the United States were $1,150,000,000, or 40 per cent more than they were under private operation in 1917. In the first six months of 1919, under continued government operation, they were 51 per cent greater than they were in the first six months of 1917, although much less business was handled. The defenders of government management claim that this great increase of expenses was not due to government operation but to advances in wages and increases in the prices of fuel and materials which were unavoidable. The defenders of private operation concede that most of the increase in expenses was not due to government operation, but call attention to the fact that the huge savings it was claimed would be made under that policy have not been effected, and claim that a very large part of the increase of expenses was due to government operation and would not have occurred under private operation. It has been urged that the increase in expenses was largely due to abnormal conditions created by the war. The advocates of private management, however, call attention to the fact that during the year following the signing of the armistice operating expenses continued to increase. Another argument which has been made in favor of government ownership is that under private ownership the railroads make large profits which are received by private capitalists, while under government ownership the profits earned go into the public treasury, or, if no profits are earned, it is because relatively low passenger and freight rates are made under state management. In support of the contention that under government ownership the public may derive large profits from the railways the advocates of government ownership may cite the examples of Prussia and Japan. Before the war the state railways of Prussia usually earned from 5 to 8 per cent upon the investment and the earnings in excess of interest charges were used for public purposes. In the years 1910 to 1917 inclusive the state railways of Japan earned from 5 to 7 per cent upon the government's investment in them, which substantially exceeded the interest on the investment.

The opponents of government ownership point out, however, that in a large majority of the countries that have tried state management, and especially in those having democratic governments, state railways usually have incurred deficits. Deficits incurred by state railways must be paid by the taxpayers while railways which are owned by companies, always, whether profitable or not, must pay large amounts in taxes. Among the state railways which have incurred large deficits are those of Italy, France, Canada, most of the Australian colonies, Austria, Russia and so on. Even the railways of the German states except Prussia usually have incurred losses. During the first year of government operation in the United States (1918) a deficit of approximately $250,000,000 was incurred, and in the first half of 1919 a deficit of approximately $300,000,000 was incurred in spite of the fact that in June 1918 the government advanced freight rates 25 per cent and passenger rates 50 per cent. The losses incurred by most state railways cannot be fairly attributed to the lowness of their rates. In some cases they make relatively lower rates than private railways, as, for instance, has been the case on the Intercolonial Railway of Canada, but this railway usually has not even earned its operating expenses. In France the passenger and freight rates of the state railways have been about the same as those of the private railways, and before the World War the rates of the French private railways were slightly lower than those of the Prussian state railways. Generally speaking the tendency has been for private railways to make their freight rates lower than those of state railways, and for state railways to make their passenger rates lower than those of private railways. The opponents of government ownership contend, and apparently the facts favor their contention, that the deficits incurred by most state railways are not due to the lowness of their rates but to the relative lack of economy in their operation. One of the arguments against government ownership and management which have been pressed the hardest, and especially in the United States and other democratic countries, is that under that policy railroad management is thrown into politics, with the result of both undermining the efficiency of management and demoralizing politics. The advocates of government ownership claim, on the other hand, that under private ownership the railroad companies are always a demoralizing influence in politics and that the only way to remove them from, and keep them out of, politics is to have the government acquire and operate them.

Evidence can be cited in support of both these contentions. For many years the railway companies of the United States hired lobbyists, kept politicians on their pay rolls, distributed free passes and used other means which gave them a great, and sometimes even dominant, influence in the politics of many States and even of the nation. But since effective regulation of railways was adopted in the United States, beginning about the year 1906, the companies have been deprived of the opportunity to exert any considerable influence in politics.

The railroads and politics have not had much, if any, effect upon each other under state ownership in countries with autocratic governments such as those of Prussia and Japan before the World War. On the other hand, the evidence demonstrates that «the railroads have corrupted politics and politics has corrupted the railroads» under the policy of state ownership in France, Canada, South Africa and numerous other countries. To keep the state railroads out of politics and politics out of the state railroad managements the governments of several countries, including those of the Australian colonies and of the Union of South Africa, have turned the management of the state railways over to railway commissioners who have been given by law a large amount of independent authority regarding railroad operation. In Canada the state railways recently have been turned over for operation to a company called the Canadian National Railways Company. While the government is practically the sole stockholder in this company, complete authority for the management of the railroads is given to the directors and officers of the company. It is generally agreed, however, by those who have studied state management in democratic countries, that there is a constant tendency for politics to break down all the barriers which are set up to prevent it from influencing railroad management, and for railroad employees to resort to political action for the promotion of their special interests.

The theoretical argument which may be made in favor of government ownership is very attractive and persuasive. The evidence indicates, however, that in all cases where state management of railroads has been measurably successful, it has been carried on under highly centralized and practically autocratic governments. In no democratic country has there been attained anything approaching the success in the state management of railroads which has been attained in Prussia and Japan. The real explanation of this seems to be that the management of railroads is chiefly a matter of administration. In governments such as Japan and Prussia had before the war, the administrative branch is strong and highly developed and dominates the legislative branch to such an extent that there is little chance for interference by the legislative branch with the management of the railroads. On the other hand, in democratic countries the legislative branch usually, under normal conditions, dominates the administrative branch, which results, where railways are owned by the state, in constant interference by the legislative branch with railroad management. But the management of railroads is an undertaking to the efficient supervision of which a legislative body is badly adapted. It would appear from past experience that if democratic governments are to make a success of government ownership and management of railroads, they will have to follow the example set by autocratic governments before the war, in giving the railroad management almost complete freedom from control and interference by the law-making body. Whether this would be consistent with democratic principles, or, in fact, with the permanent maintenance of democratic institutions, may be questionable.

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**RAILWAYS, Laws Affecting.** See COMMON CARRIERS.

**RAILWAYS, Military.** See MILITARY RAILWAYS.

**RAILWAYS, Street.** This designation is inclusive of what is commonly known as *trolley line* development and includes not only city and suburban but interurban electric roads. Electric railways are by far the most important class of roads. Of the 986 companies included in this group, four use animal power, eight cable and two use gasoline motors as the motive power for a portion of the track. The electric railway companies operate about 99 per cent of the total trackage. Only nine companies in the United States use animal power exclusively, although this was practically the only kind of power used 35 years ago. The number of revenue passengers carried per mile of track indicates a steady increase in density of traffic from 212,259 in 1902 to 216,522 in 1907; 232,556 in 1912 and 251,684 at the present time (1919). The recent relatively large increase in cars, other than passenger cars, is due to the development of freight business on interurban lines. Since 1890 electricity has practically superseded all other kinds of power.

The percentage of trackage operated by electric current increased from 15.5 per cent in 1890 to 99.6 per cent in 1919. Cable and steam power were never extensively used in the operation of street railways, but they reached their maximum about 1890.

The track operated by all street and electric railways includes not only the first, second and other main tracks, but also sidings, turnouts, track in car barns, storage yards, etc. The length of these various kinds of track, in single-track miles, amounted to 41,064 miles in 1912, as compared with 48,638 miles in 1919. Electricity is used on 40,601 miles of the foregoing 41,064 miles of street and electric railway track. All classes of non-electric power are continuously decreasing. The *overhead trolley* is rapidly decreasing although it was practically in universal use a few years ago, 38,958 miles being thus operated in 1912. The *third rail* system, being limited to elevated structures, subways, tunnels and tracks on private right of way, is still of minor importance. The conduit system, sometimes referred to as *conduit trolleys* is the most expensive type of electric traction construction and is in use only where municipal regulations prohibit the use of overhead trolleys. The greater proportion of street and electric railway track is on streets or public thoroughfares, but the suburban companies often own their rights of way or have obtained the privilege of operating tracks on private ways and in districts where interurban lines are extensively developed a large portion of the track is on private rights of way.

It is probable that more interest centres around the number of passengers carried than around any other feature of the railway service. While the increases in capital, miles of track, rolling stock, etc., show the development of the industry, no other fact is so impressive as the great number of people carried annually on the street and electric railways and the constant increase in passenger traffic. The total number of passengers in 1912 aggregated 12,135,341,716, as compared with 13,876,214,662 in 1918. The maximum density of passenger traffic centres in Manhattan and the Bronx boroughs of New York City.

No more startling changes in the street railway industry have been shown in years than

SUMMARY FOR STREET RAILWAYS OF ALL CLASSES IN 1918.

Showing operating companies, lessor companies, railways operated by electric power, cable roads exclusively, railways operated by gasoline motor power and railways operated by animal power.

| | Total | Operating companies | Lessor electric companies | Operated trackage, classified by kind of power | | | |
|---|---|---|---|---|---|---|---|
| | | | | Electricity (wholly or in part) | Power other than electric exclusively | | |
| | | | | | Cable | Gasoline motor | Animal |
| Number of companies | 1,276 | 983 | 293 | 986 | 9 | 6 | 7 |
| Miles of line | 31,105.35 | 26,234.18 | 4,971.17 | 31,021.56 | 13.84 | 58.64 | 11.31 |
| Miles of track operated | 41,531.91 | 35,118.64 | 6,413.27 | 40,972.60 | 20.13 | 59.96 | 12.13 |
| Cost of construction and equipment | $4,680,831,680 | $3,899,419,674 | $781,412,006 | $4,680,831,680 | $2,641,372 | $1,418,716 | $68,431 |
| Number of employees | 314,871 | 314,871 | ............ | 297,580 | 364 | 42 | 26 |
| Number of passenger cars | 88,464 | 88,464 | ............ | 86,201 | 69 | 15 | 19 |
| Number of revenue passengers | 10,164,514,304 | 10,164,514,304 | ............ | 8,445,951,141 | 14,187,331 | 964,214 | 213,416 |

those in its cars. In the effort to deal with problems of congestion, low rates of fare, public convenience in entering and leaving cars, the full collection of fares and safety in operation, an extraordinary number of new types have been evolved, each with its special merits. The past decade was particularly marked by an outburst of originality in this respect and probably no previous period in street railway history showed so many innovations. The modern stimulus in car design for city service may be said to have begun with the successful demonstration of the pay-as-you-enter car, which originated in Montreal and was shown first in the United States at the Columbus convention of the American Electric Railway Association in 1906. The later developments were in the extension of this principle to centre entrances, with an increase in accessibility to the car, in greater attention to safety features and in renewed use of one-man cars. Early in 1912 came first the New York *stepless car* with a body hanging near the ground between the trucks and then the low centre-entrance cars of Brooklyn and Washington and the centre-entrance, end-exit car of San Diego. These were accompanied by the *low-floor* car of Pittsburgh, in which 24-inch wheels and small motors eliminated one step and reduced the weight to an unprecedented figure. Double-deck cars based on these designs became almost obvious and came into use in 1913. In the meantime, the *near-side* principle, developed during 1911, had been applied to one-man cars, thus supplying a need for light-traffic service which had existed, but had been neglected, since the bobtail horse car disappeared. One of the most extraordinary developments was the *articulated* car of Boston, consisting of two old single-truck cars set end to end and flexibly connected by a low-hanging vestibule with centre side doors. Last among the radical designs came the storage battery *stepless* type, a four-wheeled car without a truck frame and of extremely light weight. The articulated car is primarily adapted to the rebuilding of old equipment and provides an answer to the question as to what disposition can be made of old rolling stock rendered obsolete by the introduction of new types. The new types of cars for interurban service and for heavy electric traction are less numerous and less divergent from previous types. The steel cars of the Cambridge Subway probably show a greater departure from generally accepted standards than any of the other large cars. They are equipped with three side doors and the usual platforms, bulkheads and platform doors are eliminated. In general the use of steel for car bodies has shown a marked increase. Most of the new types of city cars depend upon the girder effect of the side sheathing between belt rail and sills to support the load, the strains being carried around the doorway by heavy reinforcement. In 1913 the Chicago Elevated Railways brought out the all-steel arched-roof cars. This design was considered more economical from a maintenance standpoint as it was believed that this type of car would have a much longer life than those of composite construction. (See RAILWAYS, ELEVATED). Storage-battery cars have recently come into notable use again and various types have been adopted during the last few years in different cities and for various classes of service. Batteries of the steel-nickel or lead-lead *plates* are employed and the cars themselves exhibit a great variety of style and feature.

Maintenance of track is one of the large and serious problems of the street railway industry. A few years ago there were no fewer than 200 different types of rail in use. The girder rail development had reduced the number to four standard types, the nine-inch grooved rails and T-rails being most satisfactory. A very large amount of T-rail construction is in use throughout the country and there is abundant evidence as to its persistence as a type. In any track construction in paved streets the pavement is perhaps the most important feature, in relation both to total cost of the track construction and to the use of the street by the public and practically all of the objection which has been raised to the T-rail construction should more properly have been brought against the type of pavement used in connection with that rail.

A very marked improvement has been seen in the illumination of street cars during the last decade. By reason of the universal use of electricity in car propulsion, the lighting has also become electrical in like degree, but it has had to pass through considerable change and evolution from carbon-filament, tantalum-filament and graphitized-carbon lamps up to the modern tungsten. Although the incandescent filament lamp has been used for the lighting of street railway cars practically ever since the electric motor cars superseded the horse or cable cars, it was not until very recently that any attempts were made to utilize the generated light to best advantage by means of scientifically manufactured shades or reflectors; and it was not until 1912 that the tungsten-filament lamp of an efficiency of 1.4 watts per horizontal candle or better was perfected to the extent of making it sufficiently rugged for street railway service. Lighting energy, being but a small fraction of the total energy used by motors and being relatively cheap to generate, has not been considered as a field for economy.

An increased amount of attention has been recently paid to the subjects of signaling and dispatching on electric railways, including the use of automatic stops, or such devices as the dictaphone; while even the telegraphone, with its fine running wire to receive magnetically the record of vocal orders, has been under serious consideration in large electric railway systems in cities for «load dispatching» purposes, where it is desirable to know just what instructions have been given from one power plant to another. The main thing, of course, is the control of train movement or the automatic stopping of trains otherwise out of control. The rapid and noteworthy development in block and light signaling led to the standardization of apparatus of the different methods of control for signals; the continuous track circuit has maintained its leading position among installations on high-speed lines. This may be due partly to conservatism in following a method so universally used by the steam railroads, although one of the advantages claimed for it, namely, that it indicates broken rails, can hardly be said to apply with much force to electric railways. It has, however, a similar advantage in that it indicates defective bonding by the failure of the signals to clear. Various forms of the trolley-contact system have been installed on a number of railways. Their greatly reduced cost offers a strong incentive to installation. In addition, the possibility of introducing a car-counting device by giving the contactor a directional sense makes this system of unusual advantage where permissive signals, allowing cars to follow one another in the same block, are desired. Permissive blocking, however, except for very low speeds, is regarded with decreasing favor. The use of the telephone in train or car dispatching has become so general a thing as to excite no comment.

It is difficult to enumerate all the improvements which, step by step, have brought the electric railway motor up to its present condition of efficiency and durability. Its evolution began in the early eighties and is practically all confined to a period of about 35 years. The enclosed type of motor resulted from the large amount of trouble experienced from mud and water splashing into the early types and causing their insulation to break down. The use of the four radial poles followed the attempt to get the most compact as well as the lightest design for street-car motors. Laminated pole pieces were introduced to decrease the loss from eddy currents in the pole faces which, with the high inductions introduced with the slotted armature and small air gaps, increased greatly the total loss in the motor. Later the generator practice of saturating the pole tips by cutting off alternate pole tips from the punchings was introduced The use of mummified strapwound field coils with asbestos insulation has become practically universal and the use of round wire is permitted only on the smallest sizes of motors, where no gain is secured by the use of the flat copper ribbon. No improvement has been marked or has done more to keep the motor cars out of the repair shop than the introduction of the standard type of bearing housing and method of lubrication. The life of the bearing on the motor may now be quite up to 400,000 miles. The modern armatures and brush holders are great improvements over the earlier forms not only in accuracy of adjustment but in simplicity of insulation, substantialness of design and the use of adjustable frictionless springs. Undoubtedly the most positive power saver which has been introduced with the interpole motors is field control. This, as is well-known, is simply a revival of the old control system, used in some of the earliest railway motors. The early double-reduction motor made the most extensive use of this, since the control was entirely by commutating the field and employed no external resistance at all.

The subject of fares is one of vital importance to every street and electric railway, as upon the income derived from transportation depend, the welfare and prosperity of the line, the ability to give good service, the proper upkeep of the system in all its physical details, the payment of wages acceptable to the employees, the increase of facilities for the public and the introduction of improvements. In practically all instances the fares now in existence are fixed by franchise, by agreement with the municipality or by valuation of the property, but the elements and bases, in fact the very principles referred to in determining rates and fares, remain a subject of constant discussion and experiment. The question of free transportation is governed quite largely either by franchises or by State laws and these have recognized to a large extent local conditions in cities and in States.

Modern street car development includes that of the elevated railways, restricted in this country to a few of the largest cities, such as New York, Philadelphia, Chicago, Boston and Kansas City, in most of which they have become an integral part of the surface street car systems, operating under the same management and providing for exchange of traffic. The use of steam on the elevated roads continued for many years without complaint and the service rendered was remarkable for its efficiency, safety and regularity. Because of a rapid increasing travel, necessitating more frequent trains, and because of the inability of steam locomotives of the necessary size to haul heavier trains at higher speeds over the structures, as early as 1885 a plan was formed for equipping sections of the elevated railways in New York City with electricity. In considering the design of a steel rail to act as a conductor and at the same time to give a good contact surface for the collection of current by a moving train several important features must be considered. Third-rail installations are generally divided into three classifications as to their point of contact with the collecting device, namely, over-running contact, under-running contact and side contact. The earliest installations were over-running or top contact in which the collecting device passed over and made contact with the open top of the third-rail. The first installation used a form of collector which depended on its own weight for contact with the third-rail and the installation was exceedingly simple. These first installations were on elevated systems where there was little or no danger of the public coming in contact with the rail. Later, when the use of the third-rail contact system was taken up by interurban roads and for steam road electrification where there were possibilities of accident to the public from coming in contact with a bare conductor, it became necessary to devise some better means for protecting the rail. This led to several types of protected third-rail, and later to the under-running and side-contact construction. See AMERICAN STREET RAILWAYS and RAILWAYS, ELEVATED.

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**RAILWAYS, Suspended.** See SUSPENSION RAILWAY.

**RAILWAYS, Supply.** See SUPPLY RAILWAYS.

**RAILWAYS, Underground.** See SUBWAYS; TUNNELS AND TUNNELING.

**RAILWAYS OF THE UNITED STATES.** The aggregate length of the railways of the United States on 31 Dec. 1917 was approximately 265,000 miles, or about 50,000 miles more than the total mileage of European railways and about two-fifths of the total in the entire world. Excluding switching and terminal railways and a few minor lines performing strictly local services, as distinguished from interstate services, the total length of line, at the close of 1917, was 254,734 miles.

The development of the American railway system during successive decades is suggested by the following:

| YEAR | Miles of line | Increase in miles | Increase per cent | Miles per 100 square miles of area | Population per mile of railway |
|---|---|---|---|---|---|
| 1830 | 40 | ...... | ...... | ...... | 321,517 |
| 1840 | 2,755 | 2,715 | 6,788 | 0.13 | 6,194 |
| 1850 | 8,571 | 5,816 | 211 | .29 | 2,706 |
| 1860 | 28,920 | 20,348 | 237 | .97 | 1,087 |
| 1870 | 49,168 | 20,249 | 70 | 1.66 | 784 |
| 1880 | 87,724 | 38,556 | 78 | 2.95 | 572 |
| 1890 | 159,272 | 71,548 | 82 | 5.51 | 384 |
| 1900 | 192,941 | 33,669 | 21 | 6.51 | 393 |
| 1910 | 240,438 | 47,497 | 25 | 8.08 | 382 |
| 1917 | 254,734 | 14,296 | 6 | 8.57 | 412 |

The unequal distribution of American railway mileage, with respect to population and area, is indicated by the following table:

| STATE | Miles of line 30, June 1916 | Miles per 100 square miles of area, 30, June 1916 | Population per mile of line, 31, Dec. 1917 |
|---|---|---|---|
| Alabama | 5,495 | 10.72 | 427 |
| Arizona | 2,410 | 2.12 | 108 |
| Arkansas | 5,294 | 10.08 | 331 |
| California | 8,441 | 5.42 | 354 |
| Colorado | 5,702 | 5.50 | 171 |
| Connecticut | 1,000 | 20.74 | 1,254 |
| Delaware | 335 | 17.05 | 640 |
| Florida | 5,280 | 9.62 | 172 |
| Georgia | 7,482 | 12.74 | 384 |
| Idaho | 2,873 | 3.45 | 152 |
| Illinois | 12,742 | 21.67 | 510 |
| Indiana | 7,475 | 20.74 | 378 |
| Iowa | 9,946 | 17.89 | 224 |
| Kansas | 9,345 | 11.43 | 197 |
| Kentucky | 3,836 | 9.55 | 623 |
| Louisiana | 5,603 | 12.34 | 329 |
| Maine | 2,263 | 7.57 | 342 |
| Maryland | 1,428 | 14.37 | 958 |
| Massachusetts | 2,133 | 26.54 | 1,757 |
| Michigan | 8,876 | 15.44 | 335 |
| Minnesota | 9,153 | 11.32 | 251 |
| Mississippi | 4,439 | 9.57 | 442 |
| Missouri | 8,270 | 12.03 | 419 |
| Montana | 4,848 | 3.32 | 96 |
| Nebraska | 6,169 | 8.03 | 207 |
| Nevada | 2,318 | 2.11 | 47 |
| New Hampshire | 1,252 | 13.87 | 362 |
| New Jersey | 2,338 | 31.11 | 1,232 |
| New Mexico | 3,040 | 2.48 | 137 |
| New York | 8,493 | 17.82 | 1,221 |
| North Carolina | 5,537 | 11.36 | 437 |
| North Dakota | 5.275 | 7.52 | 143 |
| Ohio | 9,121 | 22.39 | 568 |
| Oklahoma | 6,454 | 9.30 | 348 |
| Oregon | 3,067 | 3.21 | 277 |
| Pennsylvania | 11,635 | 25.95 | 739 |
| Rhode Island | 203 | 19.03 | 3,054 |
| South Carolina | 3,724 | 12.21 | 439 |
| South Dakota | 4,279 | 5.57 | 165 |
| Tennessee | 4,091 | 9.81 | 561 |
| Texas | 15,867 | 6.05 | 290 |
| Utah | 2,137 | 2.60 | 205 |
| Vermont | 1,073 | 11.76 | 340 |
| Virginia | 4,799 | 11.92 | 460 |
| Washington | 5,698 | 8.53 | 275 |
| West Virginia | 3,974 | 16.54 | 352 |
| Wisconsin | 7,694 | 13.92 | 327 |
| Wyoming | 1,906 | 1.96 | 91 |
| District of Columbia | 37 | 61.45 | 9,917 |

Prior to 1890, the increase in railway mileage was much more rapid than the growth in population but since that year the railway construction has lagged until a comparison between 1890 and 1917 shows an increase of 28, or 7.29 per cent, in the average number of inhabitants served by each mile of railway. It may or may not be considered significant that Federal regulation of interstate rates, as embodied in the Interstate Commerce Law, began on 4 April 1887, or at about the same time as the retardation of railway building. From 1877 to 1887, the mileage added to the American railway system was 110,164, or an average of 5,508 miles per year; from 1907 to 1917, the added mileage was 76,156, or at the rate of 3,808 miles per year. Unless it is conceived that the whole area of the United States is adequately supplied with railway facilities it must be concluded that in some way the relative incentive to the investment of capital in the railway industry has been diminished.

It is interesting, in its implications as to future development, to note that if the 11 States, California, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Oklahoma, Texas and Wisconsin, contained railway facilities as liberally proportioned to their area as those of the Commonwealth of Massachusetts, their combined mileage would substantially equal the present mileage of the whole United States. This is shown by the following table:

| STATE | Railway mileage in 1916 | To establish relation to area equalling Massachusetts | | |
|---|---|---|---|---|
| | | Total miles | New construction | Per cent of new construction to present mileage |
| California | 8,441 | 41,333 | 32,892 | 389.67 |
| Illinois | 12,742 | 15,606 | 2,864 | 22.48 |
| Indiana | 7,475 | 9,565 | 2,090 | 21.85 |
| Iowa | 9,946 | 14,755 | 4,809 | 48.35 |
| Kansas | 9,345 | 21,699 | 12,354 | 132.20 |
| Michigan | 8,876 | 15,257 | 6,381 | 71.89 |
| Minnesota | 9,153 | 21,459 | 12,306 | 134.45 |
| Missouri | 8,270 | 18,245 | 9,975 | 120.62 |
| Oklahoma | 6,454 | 18,418 | 11,964 | 185.37 |
| Texas | 15,867 | 69,605 | 53,738 | 338.68 |
| Wisconsin | 7,694 | 14,669 | 6,975 | 90.66 |
| Total | 104,263 | 260,611 | 156,348 | 149.96 |

Considering the relative scarcity of capital, the rapidity with which new mileage was added from 1835 to almost the end of the 19th century is remarkable. Baltimore and Philadelphia were connected by railway in 1837 and Boston and Albany in 1842. During 1842, also, the last link in the chain of short lines connecting Albany and Buffalo was completed and the Baltimore and Ohio was extended to Cumberland. In 1851 the Hudson River Railroad, following the eastern bank of the Hudson from New York to Albany, and the New York and Lake Erie, connecting the west bank of the Hudson, opposite New York City, with Lake Erie, were placed in operation. The Baltimore and Ohio was extended to the Ohio River, at Wheeling, in 1853, and the Pennsylvania Railroad to Pittsburgh in 1854. Buffalo and Toledo were connected by rail in 1853 and the year previous witnessed the completion of the third line between Ohio and Lake Erie, the first having been finished in 1848. Chicago was reached by rail in 1852 and the Chicago and Rock Island was extended to the Mississippi River in 1854. Two years subsequently, a second and a third line from Chicago westward to the

Mississippi were added and the Illinois Central was built to the junction of the Ohio and Mississippi. The Hannibal and Saint Joseph, now a part of the Burlington system of railways, was the first line to reach the Missouri River, in 1859; in 1866 the Galena and Chicago was built to Council Bluffs. opposite Buffalo, and on 10 May 1869 the opening of the Central Pacific, with the Union Pacific and the railways already indicated, made it possible to travel by rail the whole distance from the Atlantic to the Pacific. Thus the outline of the American railway system was broadly sketched, the whole process being comprised within the years 1831 to 1866, or just half the «three score years and ten,» supposed to constitute the allotment of a normal lifetime. Subsequent construction has filled in this outline, adding numerous railway routes which parallel those first laid down and supplying old and new railways with «feeders,» extending their services to all important sources of supplies of raw materials and manufactured products and to all considerable centres of population.

At present six great systems, not including Canadian lines which compete with them even for a substantial volume of traffic having both its origin and destination in the United States, connect the north Atlantic seaboard with Lake Erie, four of them reaching onward to Chicago and three of these operating to the eastern bank of the Mississippi over their own rails. In a railway sense, New England remains an independent province, but its railways connect with the trunk lines and serve as collecting and distributing systems for interchanged traffic. Two railways, terminating upon Chesapeake Bay, at Norfolk and at Newport News, compete for traffic between the north Atlantic seaboard and the Mississippi Valley, their services being supplemented by those of coastwise steamships with which they have traffic arrangements enabling the acceptance of freight at through rates named for the combined water and rail service. Three systems connect the eastern cotton States with the Potomac River or the Chesapeake. The spring wheat States and those of the corn belt, west and northwest of Chicago, are served by six independent systems, and by a formerly independent line now in alliance with one of the northern transcontinental systems. One of these «granger» railways has been extended to Puget Sound and four have built or acquired lines into Kansas City. Seven lines connect the Gulf of Mexico with Saint Louis or Chicago, while seven «transcontinental» systems link the Pacific Coast with the Mississippi Valley. Seven railways serve the anthracite region of Pennsylvania and, in the East, five are especially characterized by heavy traffic in bituminous coal. Within this system certain railways have been developed along narrower lines and performing functions still more closely specialized, like the Virginian Railway, which is distinctively a carrier of soft coal; the Florida East Coast Railway, which handles the winter resort traffic of Florida; the Pere Marquette Railway, which is largely occupied in the service of the special agricultural production of the lower peninsula of Michigan, and the Bessemer and Lake Erie Railroad, which holds distinctive relations with the traffic in ore and coal between the Great Lakes and the Pittsburgh district. In addition there are many systems of minor extent which have industrial relations of less general significance but having relatively no smaller share in the economic existence of the nation.

There have been great changes in the geographical distribution of railway mileage. In 1860 the whole region west of the Great Lakes and Mississippi River contained but 2,745 miles of line or 9 per cent of the country's mileage; in 1917 this region contained 128,733 miles or nearly 52 per cent of the total. The following table shows the changes in distribution in greater detail:

| GROUP | Miles | | | | Miles per 1,000 miles in whole country | | | |
|---|---|---|---|---|---|---|---|---|
| | 1860 | 1880 | 1900 | 1917 | 1860 | 1880 | 1900 | 1917 |
| Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, District of Columbia | 10,013 | 21,129 | 29,983 | 32,095 | 327 | 227 | 155 | 129 |
| Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia | 8,838 | 14,778 | 35,546 | 46,079 | 288 | 158 | 184 | 184 |
| Illinois, Indiana, Michigan, Ohio, West Virginia | 9,030 | 22,645 | 36,704 | 43,040 | 295 | 243 | 190 | 172 |
| Arkansas, Kansas, Missouri, New Mexico, Oklahoma, Texas | 1,162 | 12,515 | 32,744 | 57,303 | 38 | 134 | 169 | 229 |
| Iowa, Minnesota, Nebraska, North Dakota, South Dakota, Wisconsin | 1,560 | 14,884 | 33,924 | 33,246 | 51 | 160 | 175 | 133 |
| Arizona, Colorado, Idaho, Montana, Nevada, Utah, Wyoming | ...... | 4,324 | 14,056 | 21,649 | ...... | 46 | 73 | 87 |
| California, Oregon, Washington | 23 | 2,992 | 10,389 | 16,535 | 1 | 32 | 54 | 66 |
| Total | 30,626 | 93,267 | 193,346 | 249,947 | 1,000 | 1,000 | 1,000 | 1,000 |

The relations of this railway skeleton to the economic resources of the country and their organization are apparent. The north Atlantic ports are the centres of export and import trade and, with the adjacent territory, are fields of great manufacturing activity. The lines which radiate from these ports distribute manufactured and imported goods and bring to them raw materials and products for export. Chicago and the Mississippi and Missouri river cities are gathering centres for the food products of an area which now comprises nearly all of the valley of the Mississippi and Missouri and stretches from the Canadian boundary to the Gulf of Mexico. Forest products formerly moved from the West eastward but are now brought mainly from the South or the Southwest or from the Pacific Coast. The distinctive products of the Pacific Coast and trade to and from the Orient and Alaska seek the transcontinental lines in order to gain access to the centres of population in the East or Middle West.

The important place of the railways as a part of the economic organism of the United States may be statistically indicated. The following table compares the number of employees with the total population, showing the steady increase in the proportion of the available labor of the country engaged in railway transportation:

| YEAR | Population | Railway employees: Number | Railway employees: Per 10,000 of population |
|---|---|---|---|
| 1880 | 50,155,783 | 418,957 | 84 |
| 1890 | 62,947,714 | 749,301 | 119 |
| 1900 | 76,085,794 | 1,017,653 | 134 |
| 1910 | 92,174,515 | *1,699,420 | 184 |
| 1917 | 103,500,473 | †1,780,235 | 172 |

* Not including employees of switching and terminal companies.

† For 458 companies operating 252,029 miles of line.

The foregoing data make no allowance for the large numbers employed in industries, such as locomotive and car-building and coal production, which serve the railway industry.

All measures of national wealth are subject to wide margins of error and in a smaller degree the same is true of the effort to assign money values to the properties that constitute railway capital, but the following comparisons at least indicate approximate relations at successive periods:

| YEAR | National wealth | Railway capital: Amount | Railway capital: Per cent of national wealth |
|---|---|---|---|
| 1890 | $65,037,091,000 | $8,040,707,804 | 12.36 |
| 1900 | 88,517,307,000 | 9,035,732,000 | 10.21 |
| 1904 | 107,104,211,917 | 11,244,752,000 | 10.50 |
| 1912 | 187,739,071,090 | 16,148,532,502 | 8.60 |

Since 1893 there has been a heavy marking-up of certain elements of national wealth, particularly real estate. For example, between 1900 and 1910 the reported value of farm lands increased from $13,058,007,995 to $28,475,674,169, or 118.1 per cent, although the total area in farms increased less than 5 per cent, from 838,591,774 acres to 878,798,325 acres. The average value per acre indicated by these figures for 1900 is $15.57 and for 1910 $32.40, an increase of 108.1 per cent. There was no marking up of railway assets. The marking up of farm lands was made possible by the fact, among others, that while in 1900 there were 14.72 miles of excellent and highly efficient railway per 100 square miles of farm lands there were in 1910 17.51 miles of better and more efficient railway for each equal farm area.

The utilization of railway service has increased much more rapidly than population. The following table compares the total transportation of passengers, measured in passenger miles, with the population at successive periods.

| YEAR | Population | Passengers carried one mile: Number | Passengers carried one mile: Per capita of population |
|---|---|---|---|
| 1880 | 50,155,783 | 5,740,112,502 | 114 |
| 1890 | 62,947,714 | 11,847,785,617 | 188 |
| 1900 | 76,085,794 | 16,039,007,217 | 211 |
| 1910 | 92,174,515 | 32,338,496,329 | 351 |
| 1917 | 103,500,473 | 39,739,682,000 | 384 |

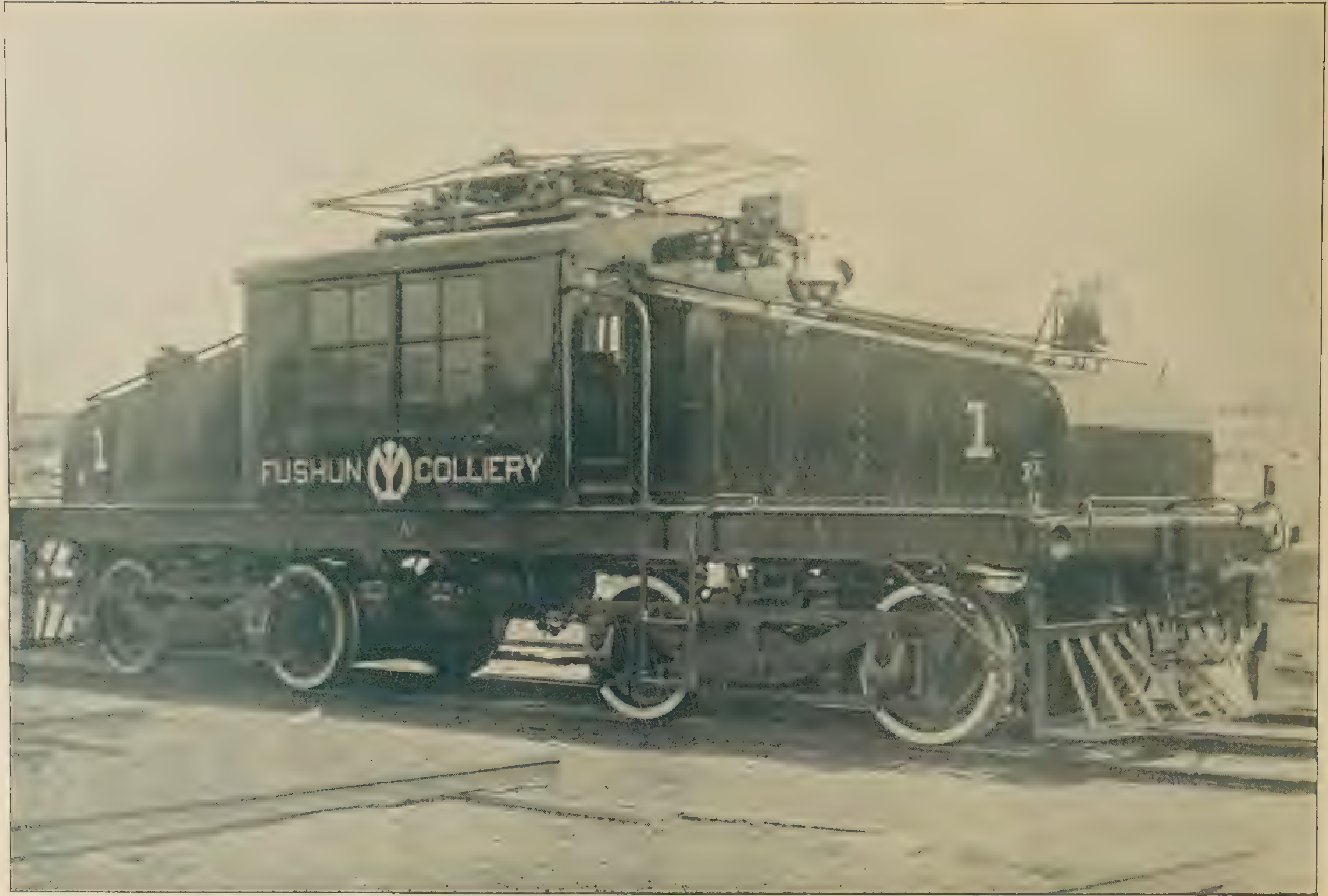
Although, as appears from the foregoing, the increase in railway passenger travel has been more than three times as rapid as that in population, the railway movement of freight has increased even more rapidly. This will appear from the following:

| YEAR | Population | Tons of freight carried one mile: Number | Tons of freight carried one mile: Per capita of population |
|---|---|---|---|
| 1880 | 50,155,783 | 32,348,846,693 | 645 |
| 1890 | 62,947,714 | 76,207,047,298 | 1,211 |
| 1900 | 76,085,794 | 141,599,157,270 | 1,861 |
| 1910 | 92,174,515 | 255,016,910,451 | 2,767 |
| 1917 | 103,500,473 | 394,040,446,000 | 3,807 |

Thus in 37 years during which population doubled, the movement of railway freight increased 12-fold; in the last 17 years, while population increased 36.03 per cent, freight movement increased 178.28 per cent.

This augmented service has been performed at rates that, measured in purchasing power over railway labor and railway supplies, have rapidly decreased and that did not fail to decrease steadily, even when measured in money, until the recent rapid decrease in the value of the circulating medium rendered some adjustment unavoidable. The following table shows the facts:

| YEAR | Passenger service | | | Freight service | | | |
|---|---|---|---|---|---|---|---|
| | Passenger miles, per capita | Average rate per passenger mile, in cents | Average payment per capita | Ton-miles per capita | Average rate per ton-mile in cents | Average payment per capita | Total payment per capita |
| 1880 | 114 | 2.442 | $2.78 | 645 | 1.232 | $7.95 | $10.73 |
| 1890 | 188 | 2.167 | 4.07 | 1,211 | .941 | 11.40 | 15.47 |
| 1900 | 211 | 2.003 | 4.23 | 1,861 | .729 | 13.57 | 17.80 |
| 1910 | 351 | 1.928 | 6.77 | 2,767 | .763 | 21.11 | 27.88 |
| 1917 | 384 | 2.103 | 8.08 | 3,807 | .728 | 27.71 | 35.79 |



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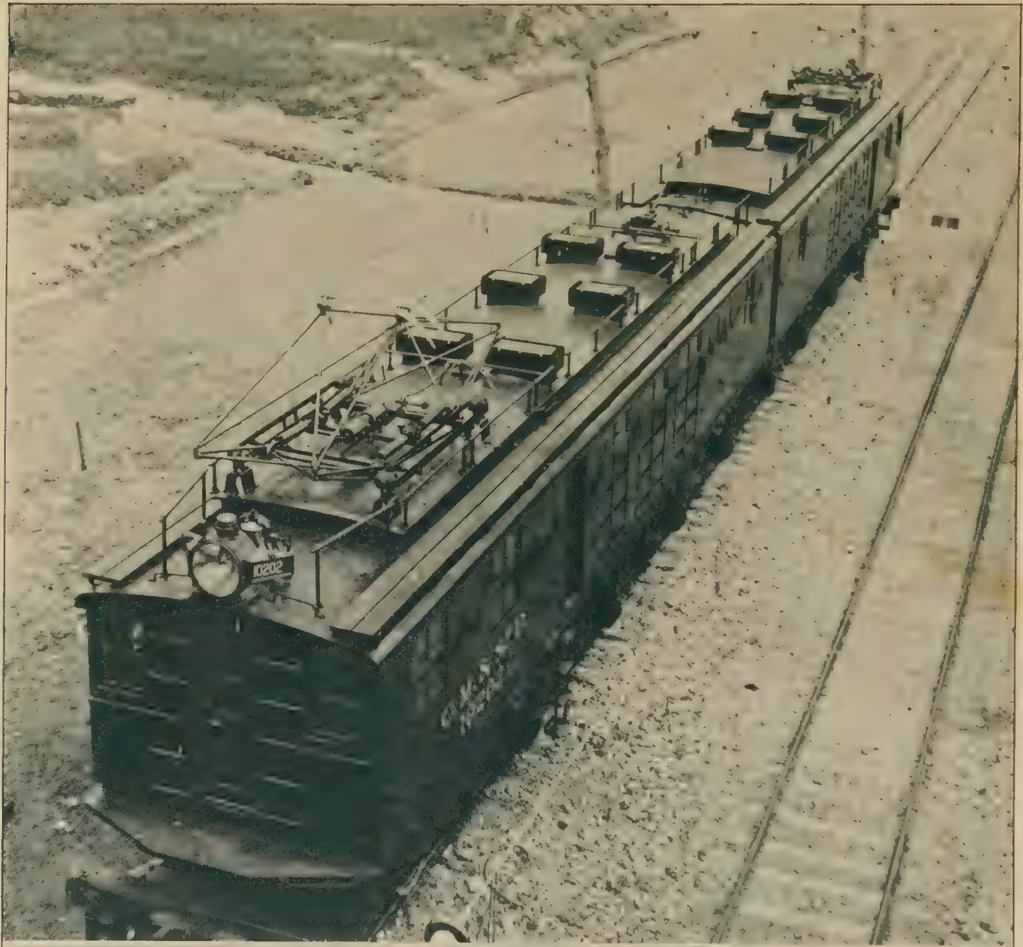
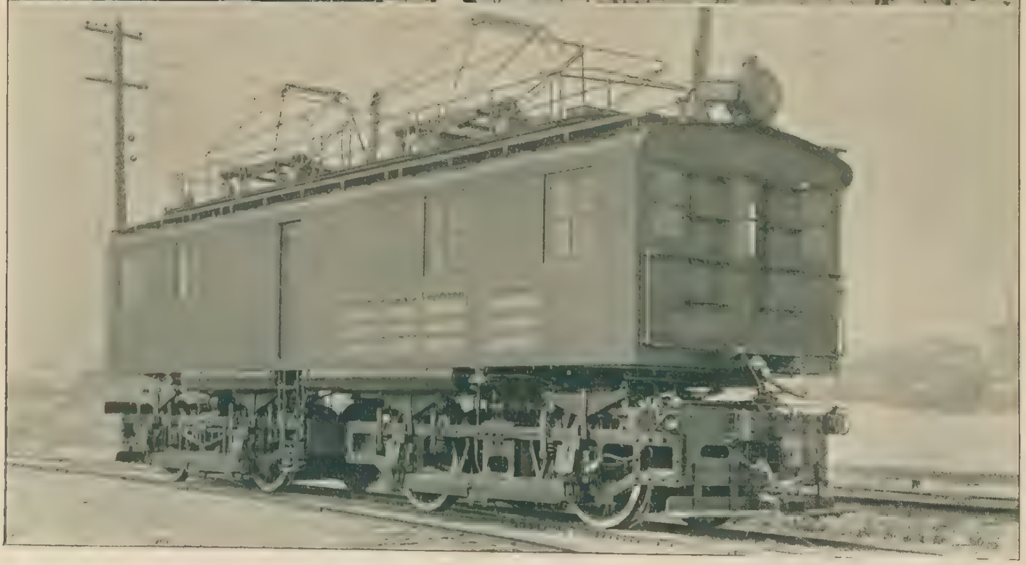
A completed modern 1200 volt electric locomotive for the South Manchurian Railroad. The Manchurian road is electrified for a considerable distance. This locomotive is used mainly for yard work and transporting coal in mining districts





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1 A modern 3000 volt locomotive built for the Chicago, Milwaukee and Saint Paul Railway, which has 400 miles of electrified track in the Rocky Mountains

2 A modern 2400 volt locomotive for Chile, to be used on the railroad of the Bethlehem Chile Iron Mines Company. This is a very large locomotive — the same general type as used on the 400 miles of electrified road of the Chicago, Milwaukee and Saint Paul in the Rockies

Analysis of the foregoing shows that the average American paid about three and one-third times (333.55 per cent) as much for railway service in 1917 as in 1880 but obtained, in 1917, about six times (590.23 per cent) as much freight service and about three and one-third times (336.84 per cent) as much passenger service. Since 1900 the total payment, in money, has about kept pace with the increase in travel and traffic movement, but the value of the monetary unit has so decreased that railway service is almost the only commodity which has not increased in price. The wages of a day's labor in any industry and the product of a day's labor or of a dollar of capital or of an acre of land in almost any industry would buy vastly more railway service in 1917 than in 1900. For example, the following values of American wheat, stated by the Secretary of Agriculture, are compared with railway rates:

| | 1900 | 1917 | Increase per cent |
|---|---|---|---|
| Wheat — | | | |
| Average farm price, per bushel...... | $0.619 | $2,009 | 224.56 |
| Average value of yield, per acre... | 7.61 | 28.46 | 273.98 |
| Railway Services — | | | |
| Average rate per passenger mile... | .02003 | .02103 | 4.99 |
| Average rate per ton-mile........ | .00729 | .00728 | Decrease |
| Wheat and Railway Service — | | | |
| Passenger miles per bushel of wheat.. | 30.90 | 95.53 | 209.16 |
| Passenger miles per acre of wheat.... | 379.93 | 1,353.30 | 256.20 |
| Ton miles per bushel of wheat........ | 84.91 | 275.96 | 225.00 |
| Ton miles per acre of wheat........ | 1,043.90 | 3,909.34 | 274.49 |

The foregoing are not exceptional, they are typical; there is no commodity of commercial importance which will not show substantially similar results.

The results illustrated above have been rendered possible only by the enormous improvements in the science and art of railway transportation which the managers of American railways have achieved. Nowhere else in the world have comparable results been accomplished. American railway men have been pioneers in fields exclusively their own and have so far succeeded that the American railway system was able, at the end of 1917, to handle far greater tonnage with relatively lower expenditure of power, including labor and fuel, at a lower capital cost per unit of traffic, and to carry both passengers and freight at the lowest rates in the world while paying the highest rates of wages anywhere received by men similarly qualified. The summary of this evolution is in the average train load of freight carried during successive years for there are few exceptions to the rule that every improvement possessing genuine economic value ultimately resolves itself into higher train capacity. The data of the following table are, therefore, of the utmost significance.

AVERAGE FREIGHT-TRAIN LOAD.

| YEAR | Tons | Increase, five-years period | |
|---|---|---|---|
| | | Tons | Per cent |
| 1890.................... | 177.42 | ........ | ........ |
| 1895.................... | 189.69 | 12.27 | 6.92 |
| 1900.................... | 270.86 | 81.17 | 42.79 |
| 1905.................... | 322.26 | 51.40 | 18.98 |
| 1910.................... | 380.38 | 58.12 | 18.04 |
| 1915.................... | 474.45 | 94.07 | 24.73 |
| 1916.................... | 534.95 | *60.50 | *12.75 |
| 1917.................... | 620.00 | †145.55 | †30.68 |

* One year, only.
† Two years, only.

The last increase, from 1915 to 1917, must astonish anyone not fully conversant with the railway conditions of 1917. The last contribution of private railway management to American efficiency in war was an increase in transportation of commodities per average train-mile of 145.55 tons in two years, or more than 50 per cent greater increase than that of any previous period of five years, with a percentage increase for the two years greater than the percentage increase of any five years' period since the year 1900. Of this increase of 145.55 tons, no less than 85.05 tons increase, or 58.43 per cent of the total, was obtained during 1917.

The more salient features of the evolution by which such results have been attained are the addition of multiple tracks, including yard and terminal tracks, in order to secure more rapid handling of trains and cars and cargoes; strengthening of road-beds, bridges and other structures to enable the use of heavier locomotives having increased tractive power; increasing the power of locomotives and the capacity of cars in order to concentrate greater tonnage in fewer trains, requiring less power and smaller track and terminal space; reducing grades and lengthening the radii of curves in order to augment the efficiency of locomotives of given tractive power.

Some of these improvements are susceptible of statistical admeasurement. The proportionate mileage of additional tracks is shown below:

| Additional tracks per 100 miles of line, in miles — | 1894 | 1904 | 1914 | 1917 |
|---|---|---|---|---|
| Second track........ | 5.87 | 7.46 | 10.76 | 11.96 |
| Third track......... | .53 | .69 | 1.05 | 1.11 |
| Fourth track........ | .40 | .49 | .81 | .89 |
| Yard track and sidings.. | 23.88 | 31.34 | 38.32 | 41.72 |
| Total, all extra tracks........ | 30.68 | 39.98 | 50.94 | 55.68 |

Increase in the power of locomotives began with the increase in the boiler pressure from 185 pounds to 220 pounds. With this accomplished, progress theretofore considered impracticable became a matter of developments in design and augmented size. The following shows what has been accomplished since 1902:

| YEAR | Number of locomotives | Average weight in tons | Tractive power, in pounds | |
|---|---|---|---|---|
| | | | Average | Total |
| 1902..... | 41,225 | 56.3 | 20,354 | 839,073,779 |
| 1907..... | 55,388 | 69.1 | 25,811 | 1,429,636,658 |
| 1912..... | *61,010 | 77.0 | 28,634 | 1,746,964,128 |
| 1917..... | 63,828 | 89.5 | 33,617 | 2,145,698,000 |

* Excludes locomotives owned by switching and terminal companies, 534 Mallet locomotives and 718 unclassified locomotives.

Derived from the foregoing, the following percentages establish rates of development which show no slackening during the period of private management.

| | Increase, per cent | | | |
|---|---|---|---|---|
| | 1902 to 1907 | 1907 to 1912 | 1912 to 1917 | 1902 to 1917 |
| Number of locomotives. | 34.36 | 10.15 | 4.62 | 54.83 |
| Average weight........ | 22.74 | 11.43 | 16.23 | 58.97 |
| Average tractive power. | 26.81 | 10.94 | 17.40 | 65.16 |
| Total tractive power... | 70.38 | 22.20 | 22.82 | 155.72 |

During the same period the number and capacity of freight cars have increased as follows:

| YEAR | Number of cars | Capacity, in tons | |
|---|---|---|---|
| | | Average | Total |
| 1902 | 1,546,101 | 28 | 43,416,029 |
| 1907 | 1,991,557 | 34 | 67,216,144 |
| 1912* | 2,215,549 | 37 | 82,976,895 |
| 1917 | 2,384,765 | 40 | 94,590,533 |

* Does not include cars owned by switching and terminal companies.

The foregoing shows an increase, for the 15 years' period, of 117.87 per cent in total freight car capacity, achieved by an increase of 54.24 per cent in the number of cars and an increase in average capacity per car of 42.86 per cent. The great value in the large car lies in the smaller proportion of the weight of the car to the paying load and the reduced effort required to move a load concentrated upon a relatively short aggregate wheelbase due to lessening of frictional resistance and air pressure.

Improvements in track and structures, signaling apparatus and methods of operation have kept pace with the more easily measured development of motive power and cars. Freight as well as passenger cars are now equipped with automatic couplers and air brakes. Safety appliances have been developed and standardized as to type and position.

The aggregate amount of work performed per mile of line has increased with the development described and suggested, with the following results:

| YEAR | Per mile of railway line | |
|---|---|---|
| | Passengers carried one mile | Tons freight carried one mile |
| 1880 | 65,434 | 368,757 |
| 1890 | 72,421 | 465,822 |
| 1900 | 82,955 | 732,362 |
| 1910 | 134,498 | 1,060,635 |
| 1917 | 157,678 | 1,563,472 |

The operating and financial results obtained may be further summarized as follows:

| YEAR | Per $100 of capital | | Per $1 available for return upon investment | |
|---|---|---|---|---|
| | Passengers carried one mile | Tons carried one mile | Passengers carried one mile | Tons carried one mile |
| 1890 | 156 | 1,006 | 36 | 232 |
| 1900 | 168 | 1,483 | 34 | 297 |
| 1910 | 226 | 1,779 | 39 | 309 |
| 1917 | 236 | 2,342 | 41 | 405 |

The period of inflation that accompanied and followed the Civil War had its natural reaction in the financial panic of 1873 and the years of business depression that ensued. The difficulties of this period produced the customary crop of politico-economic fallacies, including «Greenbackism,» the precursor of the free-silver movement of 1896 and «Grangerism.» The latter, in its inception an agrarian movement, assumed many phases most of them ephemeral, but left its permanent impress upon American legislation in the form of laws controlling railway charges and services. As the proponents of these laws proclaimed them as curatives for nearly all social and economic discomforts, they inevitably proved disappointing and were successively amended until by the end of 1917 it was generally true that prompt adjustments of rates to such sudden and urgent conditions as those arising from the rapid rise in the cost of the labor, materials and supplies required in railway operation had become impossible.

Private management of American railways was temporarily suspended at the end of 1917 by a proclamation of President Wilson, exercising an emergency power conferred to provide for the great exigencies of war, issued on 26 Dec. 1917. By this exercise of supreme authority all the railway properties, save a very few of the least importance, were taken into the possession of the Federal government which operated them through a director-general whose legal status was that of a direct representative of the President and whose responsibility was only to and through the President. The conditions which sanctioned this temporary expropriation are much misunderstood although they are not difficult of discovery or comprehension. By the end of 1917 every American industry had experienced enormous advances in its operating expenses by reason of advances in wages and in the prices of articles required as raw materials or for use in operation. All industries except the railways, and a few others subjected to similar public regulation, had made compensatory advances in prices and were enjoying an unprecedented degree of prosperity. The wages of railway labor and the prices of railway supplies had advanced with everything else but control of railway rates had been vested in the Interstate Commerce Commission and in the several State railroad commissions and without their express consent the necessary rate adjustments could not be made. The processes of these bodies were slow and their temper reluctant. While the railways waited for relief through official action the threat of financial disaster impended with increasing imminence, their credit faltered and it became evident that the fiscal condition of the railways might become an impediment to the financing of the war. The President recognized the situation, and having emergency power to take possession of the railways, as a war measure, although he had none to expedite or control the various commissions whose methods made the more radical step expedient, exercised his authority by taking the properties from their owners and vesting their management in a Federal officer, responsible only to himself. By this means he was able to provide for an almost immediate adjustment of rates of fare and freight, by increases regarded as adequate to compensate for increases in necessary costs of operation, and in the meantime to provide that the deficits should be borne out of the public funds. It cannot be too often or too strongly stated that the financial conditions resulting from public regulation were the sole cause and must forever constitute the sole justification for this step. The railways had never functioned as efficiently as throughout the 12 months which ended with 31 Dec. 1917; they did not, all things considered, function with in any degree superior efficiency during 1918.

By an Act of Congress, approved by the President on 21 March 1918, the conditions of this Federal possession were fixed and its duration limited to the duration of the war with the Central Powers and 21 months thereafter, subject to the discretionary power of the President to relinquish possession at an earlier date. The constitutional right of the owners of the properties to «just compensation» was protected, in the same act, by a grant of jurisdiction to the Court of Claims to entertain and determine suits to fix damages for such taking and use of corporate property, but provision was also made for contracts guaranteeing remuneration equivalent to the average earnings of the three years' period that ended with 30 June 1917. By the end of the first quarter of 1919, such contracts had been negotiated between the Federal authorities and a considerable number of the more important railway corporations, but there were still many which had not accepted the terms offered or as to which negotiations had not been pressed to completion.

The sudden transformation from private management, subject to public regulation, to public management, thus effected produced an entirely novel series of problems the character and dimensions of which are only beginning to become capable of recognition. They involved fundamental questions of public policy, of political and economic institutions and will require decisions which must be made within a brief period, that are certain to affect the moral and material welfare of the people for many generations. The American people have not been committed to and certainly do not desire government ownership or operation of their railway system. In proclaiming the assumption of possession by the Federal government, the President declared his purpose to preserve the operating organizations and their personnel and to do nothing to impair the rights of ownership. Congress supplemented this by an explicit legislative disclaimer of any purpose even to lay a foundation for a permanent change of ownership or of immediate control. Moreover, as the experiment continued it became increasingly evident that it offered nothing of attraction adequate to replace the advantages experienced during the long period of progress under regulated private management.

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H. T. Newcomb,
*Author of ‘Railway Economics,’ etc.*

**RAIMOND,** rā'mŏnd, **C. E.** See Parkes, Elizabeth Robins.

**RAIMONDI,** rī-mŏn'dē, **Marc Antonio** (Marcantonio), Italian copper-plate engraver: b. Bologna, about 1480; d. there, about 1534. He acquired the goldsmith's art in France and was especially successful in niello, but finally gave all his attention to engraving on copper. In 1505 he went to Venice and attracted attention by his copy on metal plate of Dürer's ‘Life of the Virgin.’ He was later attracted to Rome, where Raphael soon selected him as the engraver of his pictures. After Raphael's death Giulio Romano commissioned him to make plates from 20 of his best paintings, but having reproduced some licentious designs of that artist, Pope Clement VII ordered the plates to be destroyed by the public executioner and Raimondi was cast into prison. He was released through the intercession of the sculptor Bandinelli, and to show his gratitude Raimondi made a copy in line engraving of Bandinelli's ‘Martyrdom of Saint Lawrence.’ Losing his property in the sack of Rome (1527) he returned to Bologna, where he died a few years later. The value of his engravings after Raphael lies in the fact that they were executed under that artist's eye, and were many of them copies, not of completed pictures, but of rough draughts and tentative designs, which but for these copper-plate reproductions would have been lost to the world. Being thus brought in intimate relation with the painter's methods, he became the best interpreter of Raphael in black and white, and no engraver has so completely entered into the spirit and power of expression which breathe in the canvas of the greatest Italian painter. His best engravings after Raphael include ‘Adam and Eve’; ‘God Commands Noah to Build the Ark’; ‘The Massacre of the Innocents’; ‘Mary with the Dead Christ’; ‘The Judgment of Paris’; ‘The Three Doctors of the Church.’ Consult Delaborde, ‘Marc-Antoine Raimondi’ (1887).

**RAIMUND DE SABUNDE,** rī'moond dā sä-boon'dā, scholastic philosopher: b. Barcelona. In 1436 he appears at Toulouse as a teacher of medicine, philosophy and theology, and he labored especially to reconcile the apparent contradictions between nature or reason and the Bible, an undertaking which led him into the realm of mysticism. In his ‘Liber Creaturarum seu Theologiæ Naturalis’ he applied this principle so as practically to reconstruct the whole system of Church doctrine. He and his system have been discussed by Matzke (1846), Huttler (1851) and F. Nitzsch in the ‘Zeitschrift für historische Theologie’ (1859).

**RAIN** (Lat. *rigare;* Gk. *βρέχειν*, to wet), water dropping through the atmosphere. A mass of air in the atmosphere always contains some aqueous vapor, and if this air is cooled below a certain temperature, called the dew-point (which depends on the amount of vapor present), the vapor will condense into drops of water. The cooling may be due to radiation of heat to colder regions or to mixture with colder masses of air. When air rises in the atmosphere to colder regions, or comes in contact with a cold part of the earth, or passes from equatorial to polar parts of the earth, its moisture tends to condense into rain. In considering the probable rainfall of a place we are concerned with its latitude, its elevation above the sea, its proximity to the sea, the laws affecting its seasonable variations, the prevailing winds and the configuration of the surrounding surface. Low latitudes have in general a heavy rainfall, because of the greater evaporation in tropical regions, and the consequent formation of rain when the clouds due to evaporation get colder in the higher regions of the atmosphere. Hence also winds blowing from the equator are generally moist and winds blowing to the equator are generally dry. The presence of forests tends to increase the rainfall (see METEOROLOGY), and the rain further encourages vegetation. Over the ocean the skies are clear where the trade-winds are blowing steadily, and heavy rain falls by day in the zone of calms; on land there is a regular alternation of dry and wet seasons. Toward the equator, where there is a considerable interval between the two passages of the sun across the zenith, there are two rainy seasons. In monsoon regions, however, the alternation of dry and wet seasons depends on the winds. Beyond the tropics we have variable winds and variable rainfall. The following table gives recent figures for the mean annual rainfall of a number of stations in various parts of the world:

| | Inches |
|---|---|
| Greytown (Nicaragua) | 260 |
| Freetown (Sierra Leone) | 125.8 |
| Rangoon | 99 |
| Bahia | 95.1 |
| Batum | 93 |
| Rockingham Bay (Queensland) | 90 |
| Colombo | 88 |
| Astoria (Oregon) | 86.3 |
| Saigon | 82.96 |
| Nagasaki | 77.6 |
| Bergen (Norway) | 73 |
| Batavia | 71.4 |
| Bombay | 70.3 |
| Vera Cruz | 67.9 |
| Calcutta | 65.6 |
| Tokio | 60.4 |
| Manila | 55.2 |
| New Orleans | 55.17 |
| Saint John's (Newfoundland) | 52.9 |
| Brisbane | 52.36 |
| Sydney | 49.86 |
| Madras | 48.69 |
| Havana | 46.5 |
| Quebec | 46.07 |
| Glasgow | 45.4 |
| Halifax (Nova Scotia) | 45.34 |
| New York | 44.76 |
| Auckland | 43.62 |
| Saint Louis | 40.69 |
| Durban | 39.48 |
| Montreal | 39.28 |
| Bogota | 39 |
| Pietermaritzburg | 38 |
| Chicago | 37.57 |
| Kingston (Jamaica) | 35.79 |
| Toronto | 34.4 |
| Buenos Aires | 34.1 |
| Belfast | 34 |
| Perth (Australia) | 32 |
| Saint John (New Brunswick) | 31.75 |
| Ottawa | 31.4 |
| Rome | 30.6 |
| Berlin | 29.98 |
| Liverpool | 29.01 |
| Dublin | 28.4 |
| Edinburgh | 28.32 |
| Algiers | 26.72 |
| Charlottetown | 26.71 |
| Melbourne | 26.6 |
| Smyrna | 25.63 |
| Cape Town | 25.01 |
| London | 25 |
| San Francisco | 24.08 |
| Vienna | 23.42 |
| Nairn | 23.3 |
| Bathurst | 23 |
| Mexico | 22.9 |
| Bloemfontein | 21.29 |
| Moscow | 21.1 |
| Upsala | 21.1 |
| Lahore | 21 |
| Adelaide | 20.25 |
| Winnipeg | 20.12 |
| Marseilles | 20.08 |
| Paris | 19.68 |
| Saint Petersburg | 18.8 |
| Tobolsk | 18.6 |
| Kimberley | 18.26 |
| Irkutsk | 16.5 |
| Denver | 14.9 |
| Santiago (Chile) | 14.1 |
| Odessa | 14 |
| Yakutsk | 13.7 |
| Valparaiso | 13.5 |
| Vladivostok | 13.2 |
| North Cape | 10 |
| Regina | 8.38 |
| Okhotsk | 7.5 |
| Yuma (Arizona) | 2.9 |
| Cairo | 1.34 |
| Walfisch Bay | .3 |

It has been proven that rain has a most cleansing effect on the atmosphere, a five days' rainfall in London, England, having carried off not less than 3,738 tons of solid impurities, including 267 tons of sulphate of ammonia, and 2,000 tons of soot and suspended matters.

Rain water would be a chemically pure water but for the variety of impurities which it collects from the atmosphere in its descent. These include dust, soot, fungi spores, pollen, etc. Rain water also carries a small amount of nitrogen, ammonia, oxygen and carbonic acid gas, and in certain areas, usually over large cities, there are also present minute quantities of nitric acid and sulphuric acid. Rain water thus carries several of the necessities of plant and animal life to the earth's surface. It becomes safely potable for man only after filtration through the earth's strata, whence it emerges in springs, artesian wells, etc. Until about 1850 scientists supposed rain to be due to the mixture of cold and warm bodies of moisture-laden air. Espy first propounded the theory that it was due to the cooling of the atmosphere under the expansion of the more heated portions of air. Lord Kelvin and others soon proved this theory correct. When air expands on the withdrawal of pressure the work done in expansion is evidenced by a lowered temperature of the expanding air. By convection the warm moisture-laden air ascends and in the course of its ascent is gradually cooled until it reaches the point at which its temperature is the dew-point of the original air. Cloud is then formed and if the moisture is abundant the smaller particles coalesce into drops and fall rapidly as rain. If they do not coalesce they may continue to reach higher areas until they become ice particles. The seasonal distribution of rainfall is of greater moment to the agriculturist and stock-raiser than the total annual amount. The ideal, seldom attained, would be an equable division of temperature, rain and sunshine throughout the year. For details of the distribution of rainfall throughout continental United States consult Henry, A. J., 'Rainfall in the United States' (in 'Weather Bureau Bulletin D,' Washington, D. C., 1879); 'Rainfall and Charts of Rainfall' (in *Monthly Weather Review,* ib., April 1902); and Wallis, B. C. (in *Monthly Weather Review,* ib., January, April, June issues 1915).

**RAIN-BIRDS,** various birds so called because of their observed or supposed connection with rains or the foretelling of wet weather. The cuckoos seem to be most widely credited with foreknowledge of storms, as they are in the habit of calling most noisily at such times. Thus the yellow-billed cuckoo (see CUCKOO) is called «rain-crow» in the Southern and Western States. Further southwest and in Mexico and Central America the name is given to the anis; while in the West Indies two or three other cuckoos are so termed. These are familiar species of the genera *Saurothera, Hyetornis* and *Piaya,* the last named extending over most of the Andean region. The rain-bird of India is a quail (*Coturnix Coromandelica*), which recalls one of the names, «wet-my-lip» of the American eastern quail; and that of the Malay region is one of the broadbills (*Cymborynchus*). In England the green woodpecker is called «rain-bird»; and in the Orkney Islands one, the loons, especially the red-necked, is known as «rain-goose.» The prophetic power of the birds is exaggerated in popular estimation; but probably they do somewhat perceive a coming change of weather, especially of increased moisture, and those, like the above mentioned, which are naturally noisy, do then call more loudly and frequently than usual.

**RAIN-GAUGE,** or **PLUVIOMETER,** an instrument which measures the depth of the rainfall. In its commonest form it consists of a cylindric vessel closed at the top by a funnel-shaped lid, through a hole in the centre of which the rain falls. A narrow glass tube, rising outside the vessel from near the bottom, shows by the height of the water in it the height of the water in the vessel itself. A very simple rain-gauge consists of a copper funnel, the area of whose opening is exactly 10 square inches. This funnel allows the rain to pass into a bottle, and the quantity of rain caught is ascertained by multiplying the weight in ounces by 0.173, which gives the depth in inches. The Weather Bureau at Washington has perfected several forms of rain-gauge for more accurate observation. One of these weighs the water as it accumulates in the receiver and records regularly the gain in weight on a moving strip of paper. In regions where the rainfall is very slight there is a demand for gauges that will record the entire fall for a month or three months, and such have been made to meet these special demands. As a rain-gauge is nearer the ground it is found to indicate a greater rainfall. This is partly due to the cold raindrops getting larger in falling through the very moist air near the ground and partly to the greater occurrence of eddies about the gauge at greater heights. Hence, when the rainfall at two places is to be compared, the gauges ought to be similarly situated. A rain-gauge must be placed in as open a position as possible, out of the way of houses, trees and similar objects that may deflect the falling drops.

**RAIN-MAKING.** The problem of rain-making, or bringing rain from the clouds in a season of drought, has in all ages been of the greatest interest to humanity, as lack of expected rain has assisted in producing many famines and the loss of many millions of lives. Attempts have been made to bring rain by appeals to Divine Providence in prayer in Christian countries, while the ignorant heathen practise various forms of fetishism, and even offer up human sacrifices with the same object. Owing to the large extent of arid lands in the United States the question of bringing about rain by scientific processes has often engaged attention. It was noted that forest fires have often been followed by rain, and in 1834 James P. Espy of Pennsylvania proposed the building of enormous fires in the regions where rain was desired to bring about the needed showers. This was regarded as impracticable both in America and in Australia, where it was also suggested. That great battles, and sometimes lesser ones, attended by cannonading, were occasionally followed by heavy rainfalls has long been a popular belief, and this gave origin to the opinion that explosions similar to those of artillery might bring about rain in a season of drought. This belief did not apparently take into account the circumstances that important battles are usually fought in temperate regions, with normal rainfall, and where a disturbance of the atmosphere might easily bring a downpour from the skies. It is also averred by the opponents of this theory that the number of battles followed by rain has been comparatively small; and we now know that the tremendous quantities of explosives used in the World War had no appreciable effect on rainfall. In 1891, however, Congress made an appropriation for a series of experiments in Texas, which were conducted by General Dyrenforth for the Department of Agriculture. There has been much controversy as to the effect of these experiments which were conducted on the theory of provoking rainfall by concussion caused by explosions, giant powder being the explosive used. General Dyrenforth claimed that the experiments were entirely successful, that the drops sometimes commenced to fall within 12 seconds after the initial explosion, and that «the concussions from explosions exert a marked and practical effect upon the atmospheric conditions, in producing or occasioning rainfall, probably by disturbing the upper currents.» On the other hand, Prof. A. H. Hazen, basing his views on the newspaper reports of the experiments, argued that there was no evidence whatever that any rainfall had been produced by the explosions, while W. K. Curtis, M.D., who was with the Dyrenforth party, substantially confirmed Professor Hazen's view, and declared that rain fell before the experiments had begun. The weight of evidence was generally accepted by the public as supporting the views of Hazen and Curtis, and while the theory that rain frequently follows aerial explosions has not been wholly abandoned, no serious efforts have been made to follow up the experiments of General Dyrenforth. See METEOROLOGY.

**RAIN PRINTS,** slight depressions made in mud surfaces by falling rain drops. They are usually formed only during showers in which but few very large drops of rain fall. If they are buried beneath drifting sand or clay they may be preserved as little pits on the surface of a rock layer, or as protuberances on the under surface of the layer above. They cannot occur in rocks laid down in the sea. They may sometimes be used to tell top and bottom of a rock layer.

**RAIN-TREE,** a leguminous tree (*Pithecolobium saman*) of tropical America, now largely planted in India for the shade it furnishes, and because it flourishes in barren salt-impregnated soils, as well as for its sweet pulpy twisted pods, which are greedily eaten by cattle. Another species (*P. dulce*) with edible pods is a native of Mexico, but has been introduced into the Philippine Islands and also into India.

**RAINBOW.** The rainbow is the best known of all optical meteorological phenomena, consisting of a colored arch formed opposite the sun on falling raindrops, and visible whenever the necessary conditions of a passing shower on one side and a clear and not too high sun on the other occur. Two bows are frequently seen, each exhibiting the full spectrum of colors from red to violet; but in the inner or primary bow the red is the outer edge and violet the inner, while in the outer or secondary bow the order is reversed, the red being inside and the violet on the exterior. The colors are always arranged in a definite order, that of the solar spectrum — namely, red, orange, yellow, green, blue, indigo and violet, but shade imperceptibly into each other. The cause of this breaking up of the sunlight into its constituent colors is explained in most physical and meteorological textbooks, but may be briefly summarized as follows:

For the primary bow (Fig. 1), let PQR represent the section of a raindrop, and SP a ray of light falling on it. The ray enters the drop at

P, meets the surface again at R, is reflected to Q, where it leaves the drop in the direction of QE. The ray is refracted or bent on entering the drop at P and again on emerging at Q — the amount of this refraction depending on the acuteness of the angle at which the ray meets the surface. Now it may be shown that there is a particular point P, such that any ray from S striking the surface below P emerges again above Q, and any ray above P also emerges above Q — the former owing to the more acute angle of the reflection, and the latter to the greater refraction on entering and leaving the drop. The course of two such rays is shown by the dotted lines in Fig. 1. Q is thus a turning-point in the emerging rays, and near it a very large number of rays pass out, and an observer at E sees a bright image of S in the direction EQ. This statement applies to any one color of sunlight; but, as the refrangibility increases from red to violet, the latter is bent more at P and Q, and the line EQ lies at a flatter angle. The observer, therefore, sees the violet rays reflected on drops at a less altitude than those that reflect the red, the other colors being intermediate. The raindrop being spherical, this reflection takes place in all directions, the fixed condition being the radius of the bow, that is the angle between the line from the observer to the bow and that passing from the sun to the observer, or, in other words, the observer's shadow. For red light this angle is 42° 39′, and for violet 40° 13′. If the sun were a luminous point each color would be sharply defined, but as the disc of the sun subtends an angle of about 30′ each color is broadened to this amount, and they overlap.

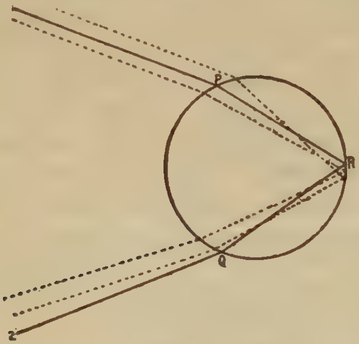

FIG. 1.

Exactly similar reasoning explains the secondary bow (Fig. 2). The light that forms it has been twice reflected, at R and at R′; the point Q lies above P, and rays entering either above or below P all emerge below Q. A glance at the diagram will show that the greater bending of the more refrangible rays makes the line EQ more nearly vertical, and, therefore, the violet rays form the outer edge and the red the inner of the secondary bow. The radius of the red is 50° 5′, and of the violet 54° 0′. The space between the bows gets no reflected light, but that inside the primary and outside the secondary is faintly illuminated by rays such as are indicated by the dotted lines in Fig. 1 and their equivalents in Fig. 2, which are not shown. These rays "interfere" with each other, and cause alternations of color which appear as spurious bows inside the primary and outside the secondary. They can only be seen with strong sunlight and small drops of rain.

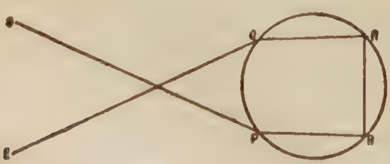

FIG. 2.

The radius of the primary bow being roughly 40°, it is evident that it cannot be seen when the sun is at a greater elevation than this, as the highest part of the bow would lie below the horizon. See LIGHT.

**RAINBOW ARCH,** Utah, a superb natural arch of red sandstone spanning Bridge Canyon on the north slope of Navajo Mountain in the southeastern corner of the State, at a point four miles above where that canyon empties into the Colorado River 16 miles below the mouth of the San Juan River. The arch rises 309 feet from the bed of the stream below. The abutments are 278 feet apart and its width on top is from 33 to 42 feet. It could easily span the dome of the Capitol at Washington and very nearly overtop the Flatiron building in New York. It has been made a national monument by the United States government. It is in a part of the Navajo country given over to the use of the Piute Indians, who called it Barohoini or rainbow. The Navajoes call it Nonnezoshe or stone

Rainbow Natural Arch, Southeastern Utah.

arch. Near one abutment are remains of an Indian altar doubtless built for worship of the arch, for it is held in great reverence by the Indians. The arch is eroded from buff colored fine-grained sandstone, brick red upon its surface but stained darker in vertical streaks, a part of the upper La Plata sandstone of Jurassic Age. It was discovered by W. B. Douglass of the United States Land Office on 14 Aug. 1909. The arch may be reached from Gate, Utah, 37 miles distant in a straight line, by several days of hard riding. Gate is 180 miles north of Gallup on the Santa Fé Railroad or 140 miles from Dolores, Colo. Consult Pogue, J. E. (in *National Geographic Magazine,* Vol. XXII, pp. 1048–56, 1911).

**RAINBOW (42d) DIVISION, The.** For a number of years before the World War discussions have periodically taken place in our newspapers whether our national guard was sufficiently efficient to be of real use to the nation. The Rainbow (42d) Division seems to be a very decisive answer and emphatically in the positive. For valor and effectiveness in the battlefields of France the ranks of the Rainbow Division take second place to none. Under authority of the Act of 18 May 1917, the 42d Division was organized in compliance with memorandum of the chief of staff for the adjutant-general of the army, dated August 1917. At its inception it contained 887 officers and 26,265 men. The division was made up of national guard troops drawn from all over the United States. It was composed as follows: Division headquarters and headquarters troop; 83d infantry brigade (165th, 166th infantry regiments and 150th machine gun battalion); 84th infantry brigade (167th, 168th infantry regiments and 151st machine gun battalion); 67th artillery brigade (149th, 150th and 151st artillery regiments, 117th trench mortar battery); 149th division machine gun battalion, motorized; 117th engineer regiment; 117th engineer train; 117th field signal battalion; 117th train headquarters and military police; 117th supply train; 117th ammunition train; 117th sanitary train. These newly-created Federal units were made up from the following national guard troops: 4th regiment infantry (Alabama); 1st separate battalion engineers (California); field hospital company No. 1 (Colorado); field hospital No. 1 (District of Columbia); Companies B, C and F, 2d infantry (Georgia); 1st field artillery (Illinois); 1st regiment field artillery (Indiana); 3d infantry (Iowa); 1st ammunition train (Kansas); 1st separate troop (Louisiana); 1st ambulance company (Michigan); 1st field artillery (Minnesota); battalion signal corps (Missouri); field hospital company No. 1 (Nebraska); ambulance company No. 1 (New Jersey); 69th infantry (New York); engineer train (North Carolina); 4th infantry (Ohio); ambulance company No. 1 (Oklahoma); field hospital company (Oregon); 3d battalion of 4th infantry (Pennsylvania); 1st battalion engineers (South Carolina); ambulance company No. 1 (Tennessee); supply train (Texas); 1st and 2d companies, coast artillery (Virginia); Companies A, F and G of 2d infantry (Wisconsin).

The headquarters of the division was organized at Camp Mills, Long Island, where it functioned for a short period. Major-General Wm. A. Mann was in command till 14 Dec. 1917, when he was succeeded by Gen. Charles T. Menoher.

Considerable doubt was expressed by some experts as to the outcome of such an unprecedented fusion of citizens of such diversity of States into one body of fighting men, the fear of dissensions among them from local jealousies and differences of viewpoints. But the officers tell of the very pride of locality of origin made a rivalry to the Westerners to outshine the Easterners, while the South and far North joined in the determination to uphold the fame of their sections of the States. And the emulation engendered a flame of patriotism on the field of battle that allowed no obstacle to delay the brave division's advance. The insignia of the division, worn during battle, was a rainbow superimposed on a field of black, carried on the left shoulder. Certainly a perfect symbol of the complex makeup of the unit, and the blending of the prismatic many-colored rays was admirably exemplified in the concord displayed by its members. Twenty-six different States and the District of Columbia were represented at first but later replacements brought in members (by voluntary enlistment or by draft) from nearly every other State in the Union.

The first units sailed for France from Hoboken, the first ship being the *Covington,* on 18 Oct. 1917. The last units arrived in France on 7 Dec. 1917. Being already partly trained by their membership in the national guard, the term of their final practice before taking an active part in the fighting line was short. And by 27 March 1918 we are told that after «just completing a month's tour at the front» in the trenches they were assigned to occupy a sector on their own account near Baccarat. Here they maintained their front (about 15 kilometers) for three months in constant contact with the attacking Germans and suffering an average of 14 casualties per day, artillery and patrol activities on both sides being fierce in May. After the first few weeks No Man's Land in front of the combatants had become controlled by the 42d after having been dominated by the Germans till the Americans' arrival, and already Huns were being made prisoners. The division was withdrawn from this sector 21 June, and transferred to a position east of Rheims after having (as Commander Menoher later informed them in a congratulatory speech) «served continuously as a division in the trenches for a longer time than any American division.» They were also the first American division to hold a division sector. And all this without previous experience in actual warfare. On their new front in the Champagne sector, under General Gouraud of the 4th French army and as part of the 21st French corps, a fierce attack in force of the Germans on the 15th July was repulsed. On the following day a terrific bombardment was followed by an infantry attack of the enemy which gained no ground but met a loss to the Germans of 27 prisoners and some machine guns, not to mention many dead left behind on their retreat. This brilliant work called for congratulations from the French commander, and, it appears, the Kaiser was present in this sector to see his 25 picked divisions break through here and make their last drive on Paris. It has been estimated that altogether 5,500 cannon had been in action during the engagement. The 167th infantry and the French mortar battery (Tennessee) were conspicuous for bravery in the action. No prisoners and none missing figured in the casualties. The French mortar battery ran out of ammunition, but Captain Gill in command offered his services to the French chief in preference to retiring, for which gallant act he was later decorated by General Gouraud. In the last week of July the Rainbow Division, the German advance being checked, was withdrawn to the Chateau Thierry section to relieve exhausted divisions who had been resisting the drive of the army of the Crown Prince. They first encountered the enemy at Trugny and drove forward toward the river Ourcq, which, on the 27th, they attempted to cross, but were driven back by heavy artillery fire. On the 28th they forced the passage; by 9 o'clock in the morning reaching their objectives of the day from Hill 212, later taking Seringes-et-Nesles, Nesles and Sergy in the face of the most desperate resistance by machine gun fire and machine gun attacks from airplanes extending back as far as Forêt de Fere, as well as accurately directed artillery fire. So obstinate was the enemy's resistance that Sergy, for instance, changed hands no less than nine times before being definitely occupied by the 42d Division. The Rainbows' brave action elicited the compliments of the commander of the French corps for its speedy work that «enabled the French division on the right to advance.» From a prisoner it was learned that it was the 4th German Guards Division and the 201st Division that the Rainbows crumpled up so badly. And the day's report to headquarters includes in its recital the words: «The command is in good condition and, having consolidated its lines, is preparing to advance as soon as orders are received.» In spite of the fearful machine gun fire maintained by the enemy the 42d Division was moving forward by 1 August, but its advance on the 3d was stopped in line of Mareuil-Endole Coulanges by machine guns, its opposing force being identified as the 1st Guard Division. The communique of the 5th states concerning the action of 2 August: «Shortly after daybreak our troops commenced their advance on the right of our line. Our only fresh troops, the 117th engineers, acting as infantry, pushed over Hill 212, which had been the scene of bloody combats during the last few days. As this regiment neared Bois de la Pissotte they were halted by machine gun fire from the southern edge of the woods. The 167th and 168th infantry were also halted by machine gun fire from the southern edge of the same woods and from Les Bonshommes and the woods to the north of it. On our left the 165th infantry and the 166th infantry, the latter in *liaison* with the French divisions to the west of us, pressed through the Forêt de Nesles and up the open field to the west of the Forêt. The 165th infantry on reaching the road Mareuil-en Dole-les Bonshommes Ferme was halted by the enemy's artillery fire in the woods. Meanwhile, the Bois de la Pissotte and les Bonshommes Ferme had been flanked and the enemy's machine gunners put to flight so that the troops on our right were able to advance abreast of those on our left. Our artillery followed the infantry advance and to-night all our regiments and one regiment of the 155th have crossed the Ourcq and are advancing slowly. Our most advanced elements, the 117th engineers, occupied Chéry-Chartreuve at dawn on August 3.» After this unbroken spell of terrific fighting the 42d obtained a well-earned and necessary rest for a short period. But already by 12 September the gallant division and its replacements were called on for forced night marches to aid in the great effort that was to bring about the reduction of the Saint Mihiel salient. The communiqué for 22 September tells us: «We made two highly successful raids on Haumont and Marinbois farm, capturing 25 prisoners belonging to two enemy divisions. Aviation and artillery activities on both sides, enemy's artillery putting down barrage on our raiding party. Our casualties, four men killed, 15 wounded.» Concerning the brilliant action of the Rainbow Division in the Saint Mihiel attack Commander Menoher says it was incorporated in the centre of the 4th army corps and: «Our men were instructed to deliver the main blow in the direction of the heights overlooking the Madine River.» General Menoher thus graphically describes the wonderful activities of the Rainbow Division at the battle of Saint Mihiel: «The 42d took every objective in accordance with the plan of the army commander. They advanced 14 kilometers in 28 hours, and forward elements pushed five kilometers further, or 19 kilometers beyond their original starting point. They took more than 1,000 prisoners from nine enemy divisions, seven villages and 42 square kilometers of territory were captured by the division, and large supplies of food, clothing, ammunition, guns and engineering material were seized.» The Rainbow Division's prowess was soon again called for after the extinction of the Saint Mihiel salient for it was called on before the middle of October to take its prominent place in the Meuse-Argonne front. Starting active aggression west of Montfaucon its advance was phenomenal and best described by its commander thus: «Some very desperate hand-to-hand fighting took place in the woods of the Argonne. Men even fought with their bare hands, and from tree to tree in Indian fashion, yelling at the top of their voices. Major Ross's battalion of the 168th infantry (Iowa regiment) particularly distinguished itself here. Both he and General MacArthur were cited for extraordinary gallantry in action. The 42d took Hill 288, La Tuilerie Farm and the Côte de Chatillon, and as the result broke squarely across the Kriemhilde Stellung, the last line of defense of the Hindenburg line, clearing the way for the advance beyond Saint Georges and Landres at Saint Georges. Marching and fighting day and night, the men of the Rainbow thrust through the advancing lines of the first army. They drove the enemy across the Meuse. They captured the heights dominating the river before Sedan and reached in the enemy line the furthest point attained by any American troops. The advance of the division to the outskirts of Sedan was probably one of the most rapid ever made against opposition. The men were pushed day and night to the limit of endurance, but they responded here as they had always when called upon for extreme effort. They made 24 kilometers in 28 hours; this was done through the most difficult country and in about the nastiest weather I ever saw in my life.» In his farewell address to his devoted division when, on 7 November, he left them, the general gave some of the remarkable facts concerning the exploits of the Rainbow Division in the following résumé: «Since 12 September you have taken over 1,200 prisoners; you have freed 25 French villages; you have recovered over 150 square kilometers of French territory, and you have captured great supplies of enemy munitions and material. Whatever may come in the future, the men of this division will have the proud consciousness that they have thus far fought wherever the American flag has flown most gloriously in this war. In the determining battle before Chalons, in the bloody drive from Chateau-Thierry to the Vesle, in the blotting out of the Saint Mihiel salient, and in the advance to Sedan you have played a splendid and leading part.» General Menoher left his command on 7 November to become director of the air service. He received two French medals, Commander of the Legion of Honor and Croix de Guerre with palm.

The final personnel of the 42d Division consisted of the following officers: Maj.-Gen. C. A. F. Flagler, commander; Col. Wm. N. Hughes, chief of staff; Maj. James E. Thomas, adjutant; Lieut.-Col. E. J. Moran, division inspector; Maj. James C. Crossley, division judge-advocate; Capt. F. B. Verney, assistant provost marshal; Lieut.-Col. George F. Graham, division quartermaster; Col. David S. Fairchild, division surgeon; Col. John M. Johnson, division engineer; Maj. John A. Wheeler, division ordnance officer; Lieut.-Col. Ruby D. Garrett, division signal officer.

The insignia of the division, which was worn on the left shoulder during battle, is a rainbow, superimposed on a field of black. In acknowledgment of its valor and great services during the World War the Rainbow (42d) Division has received no less than 205 distinguished service crosses.

On 20 November (after the armistice) the division was incorporated with the 3d corps and entered Germany with the occupation troops 2 December. It was stationed at Abrweiler after 18 December. In April 1919 the division started entraining for its home journey and on arrival dispersed to its many home quarters. The entire list of casualties of the 42d Division as published by the War Department to 10 January consisted of 1,702 killed in action; 723 died of wounds; 440 missing in action; 86 prisoners; a total of 2,950, not including field signal battalions and trains.

**RAINBOW FALLS.** See Chelan, Lake.

**RAINBOW TROUT,** a fresh-water fish (*Salmo irrideus*) indigenous to the mountain streams and rivers of the Pacific Coast of the United States, but widely introduced into Eastern waters. From the eastern brook-trout (*Salvelinus fontinalis*) it may be easily distinguished by its colors and the presence of teeth on the vomer bone; from the related salmon trouts, with some difficulty, by its small mouth, and the number of scales, about 135 in typical examples, along the lateral line. The rainbow trout is exceedingly variable and many distinct forms, which are considered by ichthyologists to be modifications of this species but which have received distinct vernacular names, are found occupying particular streams or watersheds. The complex relations of the various species of trout and salmon to their environment is little understood. From fish-culturists the McCloud River trout (*S. irrideus shasta*) has received much attention since 1880. This variety is particularly well adapted for stocking streams and ponds in which the brook-trout no longer thrives, owing to the clearing of the forests and the resulting higher temperature and increased muddiness of the water. To supply the great and constant demand for young fish for stocking purposes the Federal Fish Commission maintains several large hatcheries and many States, others. Carefully selected breeding fish are kept in specially constructed ponds designed with reference to cleanliness, good circulation and ease of handling the fish. Spawning occurs during the winter. The ripe females are stripped in the usual way and the eggs mixed with the milt in a pan either with or without water. After a few minutes water is added and they are gently agitated and repeatedly washed to remove the surplus sperm, and, after standing about an hour, are transferred to the hatching trays, which are constructed of galvanized wire. These trays are arranged in troughs with running water in such a way that the young fry fall into the latter as they hatch. As the fry grow and begin to feed they are distributed to other troughs and finally to rearing ponds, constructed in a manner to insure cleanliness and an abundance of flowing water. The young are fed on ground liver and are transplanted when several months old. They grow rapidly, but in the East never attain the large size which they do in their native streams. They feed on insect larvæ, etc., and may be fed artificially on chopped beef or liver mixed with corn meal. For angling purposes the rainbow is inferior to the brook-trout, but is a fair substitute.

**RAINES, John,** politician: b. Canandaigua, N. Y., 6 May 1840; d. 22 Feb. 1909. He was graduated from the Albany Law School in 1861, and admitted to the bar. He served in the Civil War as captain from 1861 to 1863; then began his law practice. He was a Republican member of the New York assembly in 1881–82 and again in 1885; of Congress in 1889–93; and of the State senate in 1886–89 and 1895–1909. In 1903–04 he was president pro tempore of the senate and chairman of the committee on rules. He is best known as the author of the Raines Liquor Law (q.v.), and he also framed the State Election Law.

**RAINES' LAW** (so called from State Senator John Raines, who introduced the measure), a law passed in 1896 by the legislature of New York, and since amended in several particulars, but always retaining the essential features of State control of the liquor traffic and high license for cities. The law permitted hotels to sell to guests on Sunday, and this led to the establishment of numerous places known as «Raines' Law Hotels,» which complied with the strict letter of hotel regulations, but did what was chiefly a liquor saloon business. The law brought large returns in money for city and State, the city receiving two-thirds and the State one-third of the net income from licenses, but it was generally conceded that this was at the expense of good morals. See LICENSE.

**RAINEY, Paul J.**, American explorer and big game hunter: d. at sea, 18 Sept. 1923. A man of wealth, he traveled and hunted in the Rocky Mountains, the Arctic region and in Africa and India. He became prominent through the motion pictures of wild life in the jungles of Africa and India which he succeeded in taking during his expeditions of 1910 and 1914 and which attracted worldwide interest. He contributed to *Outing* the *Scientific American Supplement* and other periodicals.

**RAINFALL.** Rainfall or precipitation, the generic term applied to the condensation of aqueous vapor into cloud, fog, dew, rain, snow, frost and hail, varies greatly in the several zones and in the successive seasons and at different altitudes. Temperature, by which is meant the temperature of the air at a given place and elevation, is one of the controlling physical factors in determining its annual rainfall or precipitation. The atmosphere, consisting according to Prof. Julius Hann of the University of Vienna of the following elements and proportions, nitrogen 78.03, oxygen 20.99, argon 0.94, carbon dioxide 0.03, hydrogen 0.01, neon, 0.0015 and helium 0.00015 parts and subject to rapid and continual changes in temperature, largely conditions precipitation over the earth, itself, owing to its varying topography, one of the controlling factors in the problem. The vast expanse of oceans, seas, gulfs and inland waters and the uplift and extent of its various mountain ranges and the expanse and location of its continents in their relation to oceans and to the torrid, temperate and frigid zones, together with the rotation of the earth on its axis and its revolution around the sun, produce different atmospheric conditions, conducive to great variation in precipitation. Furthermore the atmosphere rapidly decreases in density upwards from the surface of the earth and solar radiation likewise decreases in its intensity. The sun's rays penetrate the atmosphere at various angles and these are continually changing so that the amount of radiant energy is neither constant nor uniform in the different latitudes and seasons. Owing to these physical conditions and the inclination of the earth's axis to the plane of the ecliptic, producing unequal day and night in the four seasons, there are ceaseless movements in the atmosphere itself, such as currents, winds and storms, that affect its humidity and the amount of rainfall. Both terrestrial and solar disturbances affect the atmosphere and the amount of rainfall. In some localities periodic winds prevail with such constancy that they are denominated by such terms as «trade winds,» «monsoons,» «land and sea breezes» and some ocean currents are no less constant. All these and other physical phenomena must be considered in accounting for precipitation and its variation in different localities

Evaporation is the physical transformation of solids and liquids into gases, due to the kinetic energy of their molecules to diffuse themselves through space. Heat increases that energy of the molecules of water in whatever form it may be, though the coefficient of diffusion for aqueous vapor is greatest at the earth's surface. Professor Cleveland Abbe of the United States Weather Bureau has said that «the vapor constituent of the atmosphere is not distributed according to the law of gaseous diffusion, but like temperature and the ratio between oxygen and nitrogen, is controlled by other laws, prescribed by the winds and currents, namely — convection.» That may be either horizontal, due to the winds, or vertical, due to upward or downward currents. Temperature is also one of the most important factors in the problem of evaporation and in the distribution of aqueous vapors. Atmospheric pressure is another important factor in the problem. Atmospheric gases retard the diffusion of aqueous gases and act independently of each other. Professor Adolph F. Meyer of the University of Minnesota states that «water in the gaseous state has a specific gravity of .622, as compared with dry air,» and that «the pressure of water vapor at a given temperature is greater than the pressure of an equal amount of dry air at the same temperature,» so that when dry air is displaced in part by aqueous vapor, the weight of the cubic content is reduced. Professor Meyer maintains that when water at 212° F. passes into a gaseous state, it increases in volume 1,658 times and stores up 970 British thermal units of heat for each pound of water so transformed. The United States Weather Bureau gives the elastic pressure of saturated vapor at 32° F. as 0.180 of an inch of barometric pressure, at 68° F. as 0.684 of an inch of barometric pressure, at 100° F. as 1.916 inches of barometric pressure and at 110° F. as 2.576 inches of barometric pressure. It thus appears that vapor pressure increases much more rapidly than does temperature. Professor Meyer also states that «at ordinary open air temperatures, the elastic pressure» (also known as «vapor tension» and «gaseous pressure») «of saturated water vapor is substantially doubled for every 20° F. increase in temperature,» and «at a given temperature and pressure only a certain definite amount of water can occupy a given space and as soon as the space is saturated with moisture, dew will be deposited.» Then heat is liberated, which tends to retard a further fall in the temperature. The higher the temperature at sea-level, the greater may be the amount of aqueous vapor and stored-up heat and the slower will be the condensation and cooling. In the heat of summer, the air rises, expands, cools and as it does so, it loses its capacity to hold vapor and condensation may ensue. Professor Meyer says that «If the temperature of the vapor is 68° F. it will cool 1° in rising 425 feet.» The heat so liberated warms the surrounding atmosphere and tends to prevent further condensation, so summer showers are often of short duration.

The atmospheric pressure at the level of the sea is 14.7 pounds per square inch, which is equivalent to a column of pure water at 39.2° F. 34 feet in height. That pressure decreases one pound for the first 1,880 feet, and two pounds for the first 3,900 feet, and three pounds for the first 6,080 feet above the level of the sea, and so on until it becomes negligible. The United States Weather Bureau has compiled statistics giving the weight of a cubic foot of aqueous vapor of different percentages of saturation and at various temperatures at the level of the sea. At 32° F. a cubic foot of aqueous vapor ranges from .211 grains with 10 per cent saturation to 2.113 grains with 100 per cent saturation. At 68° F. a cubic foot of aqueous vapor ranges from .748 grains with 10 per cent saturation to 7.480 grains with 100 per cent saturation. At 100° F. a cubic foot of aqueous vapor ranges from 1.977 grains with 10 per cent saturation to 19.766 grains with 100 per cent saturation. At 110° F. a cubic foot of aqueous vapor ranges from 2.611 grains with 10 per cent saturation to 26.112 grains with 100 per cent saturation. Vapor is saturated, when it is at the point of condensation and evaporation goes on as long as there is any deficit below 100 per cent of such saturation. From the foregoing meteorological compilation, it will appear that the point of saturation and weight of aqueous vapors per cubic foot vary greatly at different temperatures. The matter under this sub-title is involved in the problems of Water Supply and will receive further consideration under that title in a succeeding volume of this encyclopedia.

**Controlling Factors in Rainfall.**—At sea-level in the tropics over such large bodies of water as the Indian Ocean, the amount of aqueous vapor moving vertically upward may exceed the quantity in a column of air over the Arabian and Sahara deserts. Still the vapor contents of the air over Siberian and Lybian deserts average nearly as much as that of the air over Vienna and Paris. The heat prevents its condensation. Were it cooled, it would produce normal rainfall. Humidity is the amount of aqueous vapor in the atmosphere, as compared with the amount of such aqueous vapor in it, when the atmosphere at a given temperature is 100 per cent saturated. Humidity, therefore, is relative and in some zones and localities it varies inversely, as the temperature, especially where there may be a lack of moisture as there is east of the Rocky Mountains and over the desert regions of the earth. When water is vaporized, pressure is exerted on atmospheric gases. Thus both vertical or convective currents may be generated, clouds may be formed and heavy rainfall may ensue, as a result of the cooling of the saturated water vapor in the upper strata of the atmosphere. The heat, liberated in the cooling process, retards the condensation and checks the rainfall. A rising barometer indicates the absence of vapor pressure, the expansion of dry air, slight evaporation and no rainfall. Humidity, temperature, topography and the physical phenomena already mentioned are factors more or less controlling, in the problem of rainfall over a given territory. There are others, such as the contour of the territory, its elevation above the level of the sea, the extent of its forests, the configuration of its mountains, the influence of continents upon humidity and character of its seasons. Notwithstanding the complexity of the phenomena, conditioning rainfall or precipitation, the same has been observed over long periods and reduced to mean annual tabulations. There have also been deduced formulæ to ascertain the presence and amount of evaporation, which, to slight extent only, indicates the amount of rainfall or precipitation, for the former may be both a contributing cause and one of the results of the latter. Dalton, Bigelow, Russell, Meyer and others have proposed evaporation formulæ to determine evaporation under various conditions of humidity, temperature, wind velocity, vapor tension and barometric pressure. The results obtained from the application of such formulæ are not identical, nor do they always conform to actual measurements, which are difficult to make.

The United States Weather Bureau and the climatological stations of some other nations have compiled statistical tables of evaporation over various land and inland water areas, but not over oceans, seas and gulfs, which altogether cover three-fourths of the surface of the earth. From all such bodies of water evaporation is continuous and the greatest. These great fountains of the deep supply the vapor-laden clouds, which are swept landward and release their waters in refreshing rains, wintry snows or in some other form of precipitation. Frequently such vapor-bearing clouds are swept against mountain ranges, as those rising from the Mediterranean Sea are swept against the Alps and those rising from the Pacific Ocean against the Andes Mountains. In some regions precipitation is much greater than it is in others, and over the same region it varies greatly in different years. That is due to the operation and effect of the physical conditions already stated. However, over cycles of years it is quite uniform, as will hereinafter appear. Deforestation decreases and reforestation increases the general average. Forests promote rainfall, retard evaporation and run off and store up precipitation in pools, ponds and lakes, some of which are the sources of streams and rivers. The United States and many other nations have bureaus, or departments devoted to scientific forestry, one of the most important and necessary functions of government, if the habitable areas of the earth are to be preserved. Deforestation and consequent lack of rainfall have rendered many once populous areas now uninhabitable, as indicated in this article. This and other generations ought not to neglect a matter of such vital importance to themselves and to succeeding generations, but ought to enter upon the systematic reforestation of all properly available areas.

**Regional Precipitation.**— The amount of precipitation, over many portions of the habitable earth, has been observed for long periods substantially as follows: In the polar regions there is no rainfall. Precipitation there is congealed in snow and icy particles. In the tropics there is little snow except on the highest mountains and most precipitation is in the form of rain. In the upper latitudes of the temperate zones there are both rain and snow. Over the Sahara, Arabia and other desert regions and in the desert regions in Australia and South America there is but little precipitation, while along windward coastal regions the annual precipitation is abundant, as found along the Atlantic and other continental coasts facing eastward. Usually those sides of mountain ranges that face oceans, or large bodies of water, have a much larger rainfall than do the opposite sides, which face inland areas. There is more rainfall on the slopes of the Sierra and Coast ranges where many glacial lakes and ponds exist in the ranges themselves, such as Tahoe, Clear Lake and others, than there is rainfall on their eastern slopes. East of some of these and of the Rocky Mountains the annual precipitation is light and large desert areas had existed, but for irrigation. No one law has been deduced from all these varied phenomena, affecting precipitation over all parts of the habitable globe to determine its amount. Much data has been collated from actual measurements. Some of these will indicate the amount of precipitation in those regions and at various altitudes.

E. S. Bellasis, sometime engineer of the Public Work in India, in substance stated that «the rainfall in India varied from 2 or 3 inches in Scinde to 450 inches at Cherrapunji in the eastern Himalayas and that at two stations in the Bombay hills, only 10 miles apart, the annual rainfall were respectively 300 inches and 50 inches and that in England at Hemstanton, it was about 20 inches, while at Seathwaite it was about 200 inches.» He stated that «the annual rainfall at Mercara in South India was 119 inches, in King William's Town in Cape Colony 27 inches, at Melbury Moor, in England 50.7 inches, at Newport in the Isle of Wight 32 inches, in the basin of the Cataract River in New South Wales from 33.7 inches, in 1896, to 56.4 inches, in 1898 in the basin of the Nepean River in New South Wales 44.3 inches and in 1905 in the valley of Sudbury, Mass., 42.3 inches.»

The water supply of a country is largely conditioned upon its water resources and the latter are dependent to a large extent upon its rainfall, or rather precipitation, which includes rain, hail, sleet and snow. The amount of annual precipitation over a given territory in successive years is not constant, nor is it uniformly distributed, except over a few such States as Wisconsin and Michigan, and over some foreign limited districts.

The annual precipitation in the State of Washington ranges from 12 to 120 inches in different localities, though in Seattle for a period of 19 years it averaged 38.8 inches. In different parts of Oregon it ranged from 8 to 138 inches and in Texas from 9.3 inches at Pasco to 48.2 inches at Houston. Nor is the annual precipitation over a locality constant from year to year. The Weather Bureau's report shows that the precipitation at Dodge City, Kan., has ranged from 9.9 to 33.7 inches. There are dry and wet years as there are dry and wet seasons. In the drought of 1894 and 1895, the deficiency in precipitation measured in the upper Mississippi Valley from 7.8 to 12 inches, in New England from 5.3 to 8.1 inches and in the south Pacific watershed from 4.4 to 4.6 inches. In three months of 1905, there was an excess of 2 inches in the rainfall at Yuma over its mean annual precipitation. In 1900, the rainfall at Bay Saint Louis, Miss., was 101.5 inches which was an excess of about 50 inches over normal precipitation for the State. The difference between the maximum and minimum rainfall on the Croton watershed (New York) in a period of 43 years was 26.8 inches and in Pittsburgh (Pa.) that difference was 25.3 inches in a period of 71 years.

**Mean Annual Precipitation in the United States and Canada.**— The United States maintains several hundred observation stations in addition to those maintained by the States themselves and by individual and corporate enterprise, where meteorological and climatological observations are made and for half a century have been made and records kept of the annual precipitation at those stations. From all such official and authentic observations and the computations made therefrom, climatological tables have been compiled, showing in most cases over periods of years the mean annual precipitation at scores of stations in the United States. Foreign countries have made similar observations and records. In nearly all of the tables, the measurements are the resultant of many observations and are denominated «the mean annual precipitation.»

From such official and from other well-authenticated measurements, the writer has selected some and averaged others from approved records to ascertain and state the mean annual precipitation over the United States and Canada. The following represent the mean annual precipitation over the localities mentioned, or they are aggregated from a number of stations over large areas, showing such precipitation. Many of these are from the reports of the United States Weather Bureau, extending over a number of years and others from authentic data. The mean annual precipitation in the coastal region of Alaska varies from 60 to 110 inches.

**United States.**— The greatest annual precipitation in the United States is over the western slopes of the mountains forming the Continental Divide which intercept the vapor-laden clouds from the Pacific and precipitate their moisture in some localities to an average of 70 to 135 inches.

Alabama.— The United States Weather Bureau gives the mean annual precipitation, as measured at 15 stations, as 52 inches, at Montgomery it is 50.8 inches and at Mobile 62.1 inches.

Arizona.—Along the Colorado it is less than 3 inches, at Phoenix 7.4 inches, at Fort Grant 15 inches and at Flagstaff 22 inches.

Arkansas.— It averages 46.7 inches, being 49.6 inches at Little Rock, 55.2 inches at Helena and 41.8 inches at Fort Smith.

California.— It ranges from 32.2 inches over the Sacramento watershed to 10.2 inches at San Diego. Professor Meyer states that it averaged 9.6 inches at San Diego for a period of 65 years. At Berkeley it is 26.47 inches, at San Francisco 23 inches and at Los Angeles 17.6 inches.

Colorado.— It is variable. At Denver it is 14.7 inches, at Pueblo 11.6 inches, at Orchard 17 inches and at Long's Peak 16.7 inches. In other sections it varies from 7.01 to 26 inches and over Colorado River watershed it is 17.7 inches.

Connecticut.— At Hartford it was 44.50 inches, at New Haven 47.2 inches, at New London 48.08 inches and at Waterbury 49.9 inches.

Delaware.— At Millsboro it was 47.3 inches.

Florida.— There is annual precipitation over the State as determined at 13 stations of 54.53 inches. At Tampa it is 53.1 inches, at Key West 37.9 inches, at Miami 58.3 inches and at Jacksonville 53.4.

Georgia.— The United States Weather Bureau reported in 1906 that the annual precipitation in the northeastern part of the State was 54.1 inches, in middle Georgia 49 inches, in southeastern Georgia 50.7 inches, at Atlanta, for a period of years, it averaged 49.2 inches, at Savannah 48.67 inches and at Clayton 68.5 inches.

Idaho.— It varies from 6.3 to 40.4 inches, but in most sections it ranges from 12 to 13 inches.

Illinois.— It averages 36.5 inches. At Chicago for 40 years it averaged 33.5 inches. At Springfield it is 37.4 inches and at Cairo 41.6 inches.

Indiana.— The mean annual precipitation over the State is 38.4 inches. At South Bend it is 34.5 inches, at Indianapolis 41.9 inches and at Marion 37 inches.

Iowa.— From the measurements at 46 stations scattered over the State, the United States Weather Bureau reported the mean annual precipitation over the State to be 31.5 inches, at Keokuk it was 35.1 inches and at Sioux City 25.8 inches, at Iowa City in 1890, it was 58 inches.

Kansas.— Measured at 19 stations, it averaged 27.3 inches, at Garden City it was 19.6 inches, at Wichita 30.4 inches, at Atchison 37.1 inches and at Topeka 34.1 inches.

Kentucky.— At 10 stations it ranged from 42.5 inches at Lexington to 50.3 inches at Wiblesboro. At Louisville it is 44.5 inches.

Louisiana.— There is great variation in the yearly rainfall. In New Orleans the annual rainfall has been as low as 31 inches and as high as 85.6 inches. For 67 years it averaged 56.1 inches. It ranges there from 55.4 to 62.6 inches and over the State from 46 inches over the southern stations to 55 inches over the eastern.

Maine.— At Portland it was 42.8 inches, at Lewiston 46.2 inches, at Eastport 43.4 inches, at Bar Harbor 48.9 inches, at Mayfield 52 inches.

Maryland and Delaware.— The annual precipitation ranges from about 44 inches in the former to 47.3 inches in the latter. At Baltimore it was 43.4 inches, at Washington and District of Columbia 43.1 inches, in the valley of the Potomac 35.28 inches. Other unofficial records give annual precipitation at Baltimore as 40.7 inches, at Washington as 40.7 inches and in the District of Columbia at 38.77 inches.

Massachusetts.— At Boston it ranged from 43.7 to 45.3 inches, at New Bedford from 46.4 to 47.9 inches, at Blue Hill Meteorological Observatory 47.2 inches, at Williamstown 39.41 inches, at Lawrence 43.1 inches, at Fitchburg 45.4 inches, at Amherst 46.3 inches, at Nantucket 36.5 inches, over the Wachusett watershed 47.1 inches and over the Sudbury watershed 45.3 inches.

Michigan.— It averages 32.91 inches and is similarly distributed. At Detroit it has averaged 32.1 inches over a period of 40 years.

Minnesota.— It averages 26 inches, while at Duluth it is 29.5 inches, at Saint Paul 28.68 inches, over the Crow Wing Valley 30.81 inches and over Croix Valley 32.58 inches. Professor Meyer gives the mean annual rainfall at Saint Paul for a period of 78 years at 27.3 inches.

Mississippi.— The mean annual precipitation is about 50 inches. In the Yazoo Valley it is 48 inches, at Natches 50 inches and at Vicksburg 53.8 inches. Over the Tombigbee watershed for a period of 50 years it has averaged 49.2 inches.

Missouri.— It ranges from 34 inches in the northwestern counties to 46 inches in the southeastern counties. It averages 39.9 inches at Saint Louis. The general average over the State is 39 inches.

Montana.— It ranges from 11.8 to 18.5 inches. At Kipp it is 18.5 inches, at Glendive 15.9 inches, at Butte 12.2 inches and at Great Falls on the Missouri 13.4 inches and at Havre 13.5 inches.

Nebraska.—As determined at 6 to 12 stations it averaged 23.5 inches and was principally in rain. At Omaha it was 30.8 inches, at Lincoln 27.7 inches and at North Platte 17.9 inches.

Nevada.—It ranges from 10.8 inches at Carson City to 11.2 inches at Pioche, but varies in most parts of the State from 3 to 12 inches. At Reno it measures 7.52 inches.

New Hampshire.—At Bethlehem it was 37.7 inches, at Plymouth 42.4 inches, at Concord and at Keene 40.4 inches and at Nashua 43 inches.

New Jersey.— The annual precipitation is 47.7 inches over the State. At Dover it is 51.2 inches, at Asbury Park 48.1 inches and at Atlantic City 42 inches. Over the Pequannock watershed it is 50.1 inches and over the Hackensack River 46.15 inches.

New Mexico.— It varies from 7.2 to 15.8 inches, though there it has had a precipitation of 25 inches. At Sante Fe' it is 14.2 inches. There is slight snowfall, though the State's highest peaks in the north are snow-capped much of the time, and those snows are its principal sources of water supply. Similar conditions prevail in some of the Rocky Mountain States, affording their principal water supply.

New York.— The mean annual precipitation at the United States Weather Bureau stations over the State for 25 years averaged 39.26 inches. Over Suffolk County it averages 45 inches. Over Long Island for 67 years it has averaged 42.56 inches, at New York City 42.87 inches, over the lower Hudson 44.93 inches, at the Croton Dam from 44.93 to 50.38 inches, over the Esopus watershed 46.6 inches, at Oxford 45.4 inches, at Albany 34.84 inches, at Little Falls 54 inches, at Utica 42.29 inches, at Binghamton 36.98 inches, at Elmira 33.23 inches, at Mount Hope 27.77 inches, at Ithaca 33.97 inches, at Cortland 44.7 inches, at Rochester 33.61 inches, at Buffalo 36.71 inches, at Oswego 36.57 inches, at Ogdensburgh 30.7 inches, at North Lake 55.7 inches and over northeastern New York 38.97 inches. Over the Taconic quadrangle it is 42 inches.

North Carolina.— The resultant of measurements at 23 stations was 52 inches. In the western counties occasionally it ranges from 70 to 100 inches, thereby becoming known as a region of extraordinary rainfall.

North Dakota.— The mean annual precipitation is from 17 to 18 inches over the State. At Bismark it is 18.8 inches. High winds blow away much of the snows of winter.

Ohio.— This State has an annual precipitation of 38.4 inches, varying from 30.8 inches at Toledo to 42.1 inches at Marietta. At Portsmouth it averages 41.1 inches. Over the Ohio River during a long period it varies from 32.07 to 45.79 inches and over the Muskingum watershed it averages 40 inches. At Cleveland it is 35.6 inches, at Columbus 37.2 inches and at Cincinnati from 38.4 to 45 inches. Professor Meyer states that it averaged there 40.7 inches for a period of 80 years.

OKLAHOMA.— It was computed by the United States Weather Bureau from the measurements of 10 stations and found to average 31.7 inches, with great variations in succeeding seasons and different years.

OREGON.— It ranges from 8 to 138 inches and at Portland it ranges from 45.9 to 78.2 inches. At Astoria it is 77.2 inches.

PENNSYLVANIA.— The resultant of the measurements of 16 stations is approximately 44 inches. At Erie it is 39.2 inches, at Pittsburgh 36.4 inches, at Harrisburgh 38.1 inches, at York 41.9 inches, at Mauch Chunk 50.5 inches and at Philadelphia 40.6 inches.

RHODE ISLAND.— At Providence it was 44.6 inches, but by the records for 79 years it averaged 45 inches. At Narragansett Pier it was 47.4 inches and at Rock Island 45.3 inches.

SOUTH CAROLINA.— It was estimated from measurements at 12 stations to be 49 inches. Monthly rainfalls in some localities and years have equalled 12 inches for a short period.

SOUTH DAKOTA.— It averages 20.3 inches, but only 1 to 2 inches fall in the form of snow.

TENNESSEE.— It averages over the State as measured at 18 stations about 50 inches, including 8 inches of snow. At Nashville it is 48.5 inches, at Memphis 50.8 and at Chattanooga 51.6 inches.

TEXAS.— The mean annual precipitation averages 30.9 inches over the entire State as determined at 19 stations, varying from 9.3 inches at Pasco to 48.2 inches at Houston. At Port Davis for 46 years it was 18 inches. At El Paso for 36 years it averaged 9.6 inches.

UTAH.— It averages 11 inches, ranging from 6.1 inches at Saint George to 16.2 inches at Salt Lake, which is mostly snow.

VERMONT.— At Burlington 33.3 inches, at Rutland 36.54 inches, at Saint Johnsbury 35.6 inches, at Northfield 33.1 inches, at Woodstock 37.3 inches and at Jacksonville 50.3 inches.

VIRGINIA.— It averaged from the measurements of 15 stations from 39.4 inches at Warsaw and Blacksbury to 50.5 inches at Big Stone Gap. At Rutland it measured 43.6 inches, at Fort Republic 38.77 inches, at Roanoke 39.09 inches and at Norfolk 50 inches.

WASHINGTON.— In the northwestern part it ranges from 12 to 120 inches, and between the Olympics and Cascade mountains it ranges from 25 to 60 inches. At Seattle for 19 years it averaged 38.8 inches.

WEST VIRGINIA.— There are 14 stations distributed over the State and the average of their measurements is 42.48 inches. Over the high plateaus the annual precipitation ranges from 45 to 50 inches, while over the lower levels along some rivers it ranges from 35 to 40 inches. Over the Greenbriar it is 44.48 inches.

WISCONSIN.— The mean annual precipitation is 31.5 inches and is uniformly distributed over the State; at Milwaukee it is 31 inches.

WYOMING.— It averages 13 inches, ranging from 8 inches in some places to 20 inches in the Yellowstone Park.

Along the Appalachian altitudes from New York to the Gulf of Mexico there is a greater precipitation than there is at lower levels along the Atlantic Coast. From the United States Weather Bureau reports of the mean annual precipitation, measured at several stations in each New England State over a period of years, it appears that it averaged in Maine 44.6 inches, in New Hampshire 40.6 inches, in Vermont 38.2 inches, in Massachusetts 44.6 inches, in Rhode Island 49 inches and in Connecticut 47.2 inches.

**Canada.**—In Canada it varies in the western, central and eastern provinces as it does in the United States. At Victoria it averaged 37.77 inches, at Port Simpson 94.63 inches, at Regina 9.03 inches, at Prince Albert 14.45 inches, at Winnepeg 19.53 inches, at Port Arthur 23.58 inches, at Toronto 33.94 inches, in Quebec 28.76 to 41.5 inches, in New Brunswick 32.6 inches with 97.5 inches of snow, in Nova Scotia 39.6 inches and 77.5 inches of snow.

**Latin America.**— In other countries of the western hemisphere records of precipitation are meagre. However, the unofficial reports indicate that the annual precipitation is abundant for the water supply of all the principal cities whether or not they be located on lakes, rivers and other fresh waters. In Mexico, at Vera Cruz, it measured 183 inches as maximum rainfall. In Central America precipitation varies greatly in different sections. Rainfall in the latter ranges from 50 to 200 inches annually. In Cuba at Havana it ranges from 40 to 80 inches. There is a great variation of precipitation in South America owing to its physical formation with the lofty Andes extending along its entire western border and their many lateral ranges, its high arid plateaus and swampy regions, its vast area extending from 12° north latitude across the equator to 55° south latitude and from 35° to 82° west longitude, its tropical heat over most of it and its wintry climate in some other localities and its general location with reference to the Caribbean Sea, the Atlantic and Pacific oceans. The climate is as variable as all such physical conditions can produce. Generally speaking, the precipitation is not only abundant for its water supply in most of its coastal regions, but over some areas it is excessive. Over its interior elevated districts it is slight and great desert regions exist in Brazil, Bolivia, Peru, Argentina and Patagonia, where there is but little precipitation. The annual precipitation at Bogotá is 44 inches, along the coast 73 inches, at Carácas from 24 to 34 inches, at Valdivia 108 to 115 inches, in Uruguay 43 inches, in Argentina from 2 to 63 inches and in Patagonia from 19 to 97 inches. In many parts of Brazil there is heavy rainfall and in other mountain sections there are heavy snowstorms. At Rio de Janeiro it is from 43 to 59 inches, at Blumenau 53 inches and at Ceará 60 inches. The precipitation is abundant in most of the Western States, where high mountains intercept the vapor-laden winds from the Pacific. There are many large lakes high above sea-level, one of them being Lake Titicaca, with an area of 5,000 square miles, 12,545 feet above the sea. It falls in rain and snow and not only waters vast areas but supplies the headwaters of the Amazon and other great rivers.

**Europe.**—In Europe a few measurements will illustrate the mean annual precipitation. In England the annual precipitation varies from 25 inches or less at the mouth of the Thames to 60 inches in the lake district and in a part of Wales, while in other districts it is 40 inches. In the western counties of England near high hills it ranges from 80 to 150 inches, while in other sections it averages from 30 to 45 inches. In the eastern counties it ranges from 20 to 28 inches. The mean annual rainfall on the Vyrnwy watershed is 65.16 inches. At Litton in Bristol watershed for 58 years it averaged 41.1 inches and at Bristol 30.9 inches. Over the Thames area for 21 years it averaged 26.9 inches. Over Derwent Valley it varies from 35 inches in the south to 61 inches in the north. Over the Sheffield waterworks catchment areas precipitation averaged about 47 inches. The average rainfall over the whole of England is about 30 inches.

In the west of Scotland it ranges from 39.37 to 100 inches while in the eastern counties it is only 26 inches. At Ben Nevis it is 151 inches. Over Edinburgh district waterworks for 6 years precipitation averaged about 48 inches. Over the headwaters of the Usk, Wye and Towy rivers in Wales rainfall ranges from 45 to 75 inches per annum. In Ireland there is heavy precipitation near the high hills in the west though less than in the Highlands of Scotland. Its general average is more than it is in the eastern districts of England. Over the valley of the river Vartry the annual rainfall averages 48.82 inches. In Norway the annual precipitation varies from 12 inches at Dovre Fjeld to 83 inches between Bukken Fjord and Nordfjord. At Bergen it ranges from 73 to 89 inches. In Sweden the annual rainfall ranges from 12.32 inches at Karesuando to 45.82 inches at Cattegat. In Denmark the annual precipitation ranges from 21.58 to 27.87 inches. In Holland it averages 27.99 inches. At Utrecht it is 27.5 inches and at Tilburg it is 27.6 inches. At Amsterdam and The Hague it averages 27 inches. In Belgium the precipitation is approximately 28 inches. At Brussels it is 27.6 inches. The annual precipitation in France averages about 32 inches. For many years it averaged at Marseilles 20.75 inches and at Nantes 35 inches. Over the Rhone it ranges from 20 to 63 inches, averaging 36.32 inches. Over the Meuse it is 28.33 inches, over Yonne 30.80 inches, and over the Seine 22.7 inches. In the south of France precipitation is less than it is along the Atlantic Coast. In Switzerland the annual precipitation has been 21.7 inches, at Sierre, 32.7 inches, at Geneva, 36.6 inches, at Berne, 42.6 inches, at Montreux, 48.7 inches, on the great Saint Bernard, 65.4 inches, at Lugano, 87.3 inches, on San Bernardino Pass, 89.7 inches of rain and snow in the Alps, facing north or south, thereby intercepting vapor-laden winds from the Arctic Ocean or from the Mediterranean Sea. In the valley of the Inn River it ranges from 22.43 to 57 inches. Scores of glaciers are found in the great elevated valleys of the Alps, and these feed the Rhine, the Rhone, the Po and the Inn rivers and their tributaries. The snows and glaciers cover the high ranges and intervening valleys, whose uplift resembles the foaming billowy ocean. At Saint Maria in the Alps the precipitation is 104.35 inches. In Germany it ranges from 20 to 34 inches. At Berlin it is 22.8 inches. Over the Moselle it is 29.48 inches, over the Rhine 36.69 inches, over the Main from 16 to 27.44 inches and over the Oder 24.60 inches. For 10 years it averaged 47.1 inches over the Mangfall Valley near Muhlthal. In Austria the annual precipitation ranges in various sections from 20.24 to 60 inches, and on the Dalmatian Coast it has been as high as 177 inches. At Vienna for 34 years it averaged 23.42 inches. In Hungary it averages 24 inches, at Budapest 34.32 inches, at Zagrab 70.39 inches, at Fiume and over the mouth of the Danube it is 35.12 inches. In Russia, where there are many mountains, high plateaus and extensive plains facing the Arctic Ocean, there is precipitation in the form of much snow, but not extensive rainfall. The average rainfall in Archangel is 16.2 inches, in Helsingfors, Finland, 19.6 inches, in Petrograd 18.3 inches, in Dorpat 24.9 inches, in Moscow 23 inches, in Warsaw, Russia, 22.8 inches, in Odessa 15.6 inches, at Batum 93 inches, at Sochi 80 inches, in Poti 64.9 inches; while in Astrakhan it is only 5.7 inches and over the plains of Russia but 20 inches. In Portugal, whose westerly coast is exposed to the winds of the Atlantic, there are heavy fogs and precipitation in the north occasionally amounts to 192 inches, while in the interior and in the south there is far less rainfall. In Spain rainfall averages at Madrid 15 inches, at Salamanca 11.3 inches, at San Fernando 30 inches, at Bilboa 46 inches, at San Diego 66 inches, at Oviedo 74 inches and over large areas there is but little precipitation and intense heat. Italy has moderate precipitation. The Alps in the north and its Apennines, extending nearly its entire length, intercept the vapor-laden winds of the Mediterranean and Adriatic seas. It projects southerly into warm latitudes and has a hot summer climate. Over it in the classic ages Jupiter Pluvius reigned from sea to sea. Precipitation varies from 36 inches in the north to 20 inches in the south of Italy. In Sicily it averages 15 inches. Sunny Italy is characteristic of its central and southern sections, where there is infrequent and scanty rainfall in summer months. Over the Po the rainfall ranges from 30 to 48 inches and snow in the north and mists along the coast are not uncommon. The precipitation at Tolmezzo is 96 inches. In Lombardy precipitation averages 22 inches, and irrigation canals are necessary to supply the lands with sufficient water for agricultural purposes. Nearly all Italian cities are supplied with water from rivers and mountain or ground sources. Aqueducts and infiltration tunnels through tufa without linings have long been in use to maintain such supplies. Through such tunnels 22 gallons per second are delivered at Mazzara and 40 gallons per second at Zappulla in Sicily.

Dr. Angot calculated the rainfall by months at Rome and found the annual precipitation there to be 12.03 inches and at Milan to be 12.01 inches. In Greece the annual precipitation ranges from 16.1 inches in Attica to 53.34 inches in the Ionian Isles. Olympian Zeus presided over atmospheric changes and his chief weapon was the thunderbolt. The Grecian states are well watered. In Bulgaria the mean annual precipitation is 29.59 inches. In Rumania rainfall ranges from 15 to 20 inches. The water supply of Constantinople is from streams, springs and rainfall in the forests where reservoirs impound the waters that are conducted in aqueducts, one of which was built during the reign of Constantine.

Several rainfall maps of Europe have been made and these may be consulted for further information on this subject. However, it may be stated that all western and northern Europe are abundantly supplied with copious rains and all the mountains with heavy falls of snow that supply the headquarters of its large rivers flowing to the salted seas on the north, west and south. They supply populous areas in many parts of Europe.

**Africa.**— In the continent of Africa precipitation ranges from 1.5 inches in Egypt to 20 inches on the southwestern coast and to heavy rainfall in its tropical areas. In Abyssinia it ranges from 30 to 40 inches supplying some tributaries of the Nile. Along the southeastern coast facing the Indian Ocean the rainfalls is 50 inches while in the interior of South Africa it ranges from 5 to 24 inches and at some places on the east coast it is only 40 inches. At Johannesburg, it averages 30 inches, at Paarl and Weltevreden in Cape Colony it averaged for 14 years 34.67 to 35.97 inches. The annual rainfall at Durban is 42.46 inches and at East London, South Africa, it is 62.11 inches. Heavy fogs dampen some areas where there is but little rainfall.

**Asia.**— In Arabia are great waterless deserts while in some mountain areas living springs of water are found. There is some rainfall in northern and central Arabia. At Dhala in 1892 there was over 18 inches, while at Aden it averaged 2.97 inches. Sir A. Houtum-Schindler found the mean annual rainfall at Teheran for 15 years to average 9.86 inches and reported that at 15 stations in Persia for various years it ranged from 3.24 inches at Jask to 56.45 inches at Resht. The average at all these sections was about 17 inches.

Asia presents so many physical formations of mountain ranges, elevated plateaus, great river basins, extensive arid regions, varying climates and oceanic influences as to cause excessive precipitation of rain and snow in some great mountain areas and little in some other sections. Only a few measurements can be given. The mean annual precipitation over the Caspian watersheds is 7 to 8 inches, over the Aral Sea 6 inches, in western Syria facing the Mediterranean a moderate rainfall, at Beirut it is 21.66 inches, at Jerusalem, 36.22 inches. The normal rainfall over Palestine is about 28 inches, while in the vicinity of the Lebanon range it is copious. There is very little rainfall east of Damascus and over eastern Syria. Between the Orontes and Euphrates some of the slight rainfall is caught and stored up for the water supply. The water of the springs in the vicinity of Mount Lebanon is conducted into cisterns and conserved for domestic and agricultural purposes. Hundreds of water-wheels, operated by the current of the Orontes, or by animal power lift its waters to supply communities along its banks and to irrigate agricultural districts. Astride the Orontes 120 miles north of Damascus is the land of Hamath, supplied by six or more great undershot water-wheels, some 80 feet in diameter, that raise the water of the river into conduits extending through the city. Other sections are supplied with water drawn from wells by endless ropes carrying buckets and operated by camels turning vertical spindles. Irrigation in its primitive form is practised in parts of Syria. The Romans also practised it about the Sea of Tiberias, where the remains of aqueducts may still be seen. The waters of the Abana rushing down over wheels placed in the falls of the Anti-Lebanon ranges develop power to propel the street cars of Damascus and to light that ancient city, which obtains its water supply through conduits from the same sources. In Asia Minor swept by the cool winds of the Black Sea there is much snow and there are occasional heavy rains. It has many springs fed by the underground flow produced by the melting snows of its high mountains. It has some lakes, whose waters are somewhat depleted during the long dry season. In 1912, Dutch engineers designed and French contractors constructed irrigation works to utilize the waters of Bey-Sjehir and Jaila lakes and a canal connecting with the Tsjartpjamba River to irrigate 126,000 acres of Konia Plain.

Over the territory extending from the Jordan to the Persian Gulf there is slight rainfall and much of it is a desert uninhabited.

In Siberia there is much snow and little rainfall. The latter ranges from 8 inches from Persia to Tobolsk and increases to 12 inches over Amur watersheds. Snow falls over vast areas in great quantities and in the mountains remains most of the year, feeding its lengthy rivers and its numberless lakes. Some of these, such as Baikal 400 miles long by 20 to 50 miles wide and Lake Kossogol 120 miles long by 50 miles, cover great areas in a basin that was once a much longer lake. In eastern Siberia rainfall averages from 15 to 20 inches. In Manchuria and northern China between the Volga and the Lena the rainfall ranges from 19 to 29 inches.

In China it ranges from 23 inches at Peking to 78 inches at Canton, which is swept by monsoons. It is only 5 to 7 inches in the north of Mongolia. In some coastal regions it amounts to 100 inches. Over the coastal regions of the Malay Peninsula the rainfall ranges from 75 to 200 inches and over places in Java it is 78 inches, at Singapore it is 97 inches. Siam is occasionally swept by monsoons and the rainfall ranges from 180 inches at Mergni to 240 inches at Monlmein. At some other places it averages from 42 to 54 inches.

In India there is the greatest variation in precipitation in Asia. In its western coastal and Himalaya regions rainfall ranges from 75 to 100 inches on the west to 250 inches at elevated localities, also in the west up to 610 inches in the Khasi Hills, where for a decade it averaged 550 inches. If entirely caught and conserved it would form a column of water 45 feet high. At Cherrapunji for 40 years it averaged 426 inches. At Calcutta it averaged 65 inches. At Ceylon from 60 to 80 inches. At Madras 55 inches. At Bombay 75 inches and in the valley of the Ganges it falls to 25 inches and in that of the Indus to 6 inches. At Poovah it is 24 inches. North of Punjab, it ranges from 70 to 80 inches and also that amount on some of the lateral spurs of the Himalayas.

There are no available records of precipitation in countries to the north of India, but they are light, cold and covered with snows, which are their principal source of water supply. In Burma on the west coast it averages from 157 to 196 inches. Over the Irrawadi Valley in Burma it is only 39.27 inches, but in the delta it averages 98.42 inches. In Japan the average rainfall over the whole country is 61.8 inches.

**Australasia and Oceanica.**— In Australia rainfall varies greatly in different sections. At Brisbane it averages 50 inches, at other places 70 inches. At Melbourne it averages 25.6 inches, at Port Phillip from 20 to 30 inches, at Adelaide 20 inches and in some parts of the Eyre Peninsula only 10 inches and this average extends to more than ⅓ of the continent. In South Australia it averages from 8 to 10 inches. In 1889 the Department of Mines at Sydney collated rainfall data and estimated the amount at 50 or more watering places in Australia. Those showed the weekly rainfall to range from $\frac{1}{10}$ of an inch in some localities to an inch in others and still others it ranged from 2.25 to 3.10 inches. In most of the inhabited regions of New Zealand, rainfall ranges from 30 to 50 inches per annum. In New South Wales it ranges from 12 to 46 inches. At Hay it ranges from 10.94 to 25.84 inches.

In the Philippines there is great variation in rainfall. At Manila it averages 76 inches and ranges from 16.2 to 152 inches over different islands. At Kauai, one of the Hawaiian islands, it averaged for 4 years 518 inches. On the island of Mauritius rainfall on the east coast has been as high as 141 inches and on the west coast at the same time it averaged only 27.95 inches.

In Java a rainfall ranges from 70 inches at Batavia to 174 inches at Buitenzorg.

Except as otherwise stated, the foregoing are approximately the mean annual precipitation over the localities mentioned, as nearly as the measurements extending in most cases over a period of years disclosed. They furnish some data that may be considered in estimating such sources of their water supply.

Robert Lauterberg, meteorologist of Switzerland, once suggested that most measurements fail to give all the rainfall and that ordinary measurements must be increased 25 per cent to arrive at the actual precipitation.

There are, however, many instances of well-known departures from the amounts heretofore given, when in wet years or cycles of years, or localities of excessive precipitation, the maximum precipitation is greater than the mean annual precipitation. There are also dry years or cycles of years and dry localities, when the minimum precipitation is less than the mean annual precipitation. Such extremes are not constant, but may be considered in determining the hydrology of a given locality.

The foregoing records and measurements of rainfall are the mean annual precipitation over periods of years. Excessive precipitation, however, occurs in storms, when the hourly and daily rates in the localities affected may be extraordinary. Such storms are usually of short duration and are confined to small areas. Records of some of such excessive precipitations and of monthly tabulations in localities, where meteorological stations are maintained, are obtainable from the reports of the weather bureaus of this and other countries. Most of such measurements are included in the general averages of mean annual rainfall hereinbefore stated.

**Disposition of Precipitation.**— The disposition of rainfall or precipitation is quite fully considered in the article on «Water Supply,» which is to follow under that title in a succeeding volume of this encyclopedia.

Henry W. Hill,
*President of the New York State Waterways Association; author of ‹Waterways and Canal Construction in the State of New York,› etc.*

**RAINIER, rā'nēr', Mount.** An old volcanic cone in central western Washington named from Admiral Rainier of the British navy by Vancouver the navigator, who saw it from Puget Sound in 1793. It is also known by the Indian name of Tacoma Peak and rises about 56 miles southwest of the city of Tacoma. Its altitude is 14,408 feet or about 8,000 feet higher than the adjoining Cascade Mountain region. It was once thought to be the highest peak in the United States but Mount Whitney in California is 93 feet higher and a few peaks in the Rocky Mountains in Colorado exceed it slightly. Its upper part is mostly covered by snow and ice, the latter in 11 main glaciers radiating from the summit like the arms of a great starfish. The glaciers are from four to six miles long and equal in size and beauty those in the Alps. The larger one extends down to 4,000 feet. A luxuriant forest extends part way up the slopes, and the timber line is between 7,000 and 7,500 feet. Around the base are many natural meadows of most picturesque character with profusion of summer flowers. The peak, «the noblest of the fire-mountains which, like beacons, once blazed along the Pacific Coast,» is the remains of a huge volcano built up of thick layers of lava and originally 2,000 feet or more higher, its top having been blown off by a great explosion a few centuries ago. A large crater resulted from this eruption and several small cones and craters have since been built. The latest eruptions were slight ones in 1843, 1854, 1858 and 1870. Now the only activity is a slight emission of steam at one locality. The first ascent by a scientific observer was made by S. F. Emmons in 1870.

In 1897 it was ascended and thoroughly explored by a large party. «Almost 250 feet higher than Mount Shasta, its nearest rival in grandeur and in mass,» they described it as «overwhelmingly impressive both by the vastness of its snow-capped summit, its glacial mantle and by the striking sculpture of its cliffs.» The total area of its glaciers amounts to 45 square miles, an expanse of ice far exceeding that of any other single peak in the United States. The region now forms the fully protected Mount Rainier National Park created by act of Congress approved 2 March 1899. Centred by the towering mass of Mount Rainier, the park reserve is nearly a perfect square, the sides of which are 18 miles in length and contains 324 square miles, or sections of 640 acres each (207,360 acres). It is completely surrounded by lands embraced within the Rainier National Forest. Every year large numbers of tourists visit the park to camp in its meadows, and occasional ascents are made to the summit of the mountain. Consult ‹Mount Rainier National Park,› and *Annual Report* by the supervisor of the Mount Rainier National Park (Washington, D. C., Department of the Interior, 1915 et seq.).

**RAINS, George Washington,** American military officer and scientist: b. Craven County, N. C., 1817; d. Newburgh, N. Y., 21 March 1898. He was graduated from West Point in 1842, served in the engineering corps, was transferred to the artillery, and in 1844–46 was assistant professor of chemistry, mineralogy and geology at West Point. He served on the staffs of Generals Scott and Pillar in the Mexican War, and received brevet rank of major, was active in the Seminole War, and in 1856 he resigned from the army and engaged in business. At the outbreak of the Civil War he entered the Confederate service, was commissioned a colonel and placed in charge of the building and equipment of a powder mill at Augusta, Ga., where he remained until the end of the war, receiving promotion to the rank of brigadier-general. In 1867 he became professor of chemistry and pharmacy in the University of Georgia, and was dean of the faculty there till 1884. He was interested in mechanics, and secured several patents on his inventions for improvements for steam-engines. He wrote ‹Steam Portable Engines› (1860); ‹Rudimentary Course of Analytical and Applied Chemistry› (1872); ‹History of the Confederate Powder Works› (1882), etc.

**RAINSFORD, William Stephen,** American Episcopal clergyman: b. Dublin, Ireland, 30 Oct. 1850. He was graduated from Saint John's College, Cambridge, in 1872, took orders in the English Church, and in 1873–76 was curate at Saint Giles', Norwich, England. In 1876 he came to the United States and engaged in evangelistic services in New York. He was assistant rector at Saint James Cathedral, Toronto, 1876–83, and in the last-named year became rector of Saint George's Church, New York, from which he resigned in 1906. Under his management the work of the parish was greatly extended and many societies and missions were established in connection with it. He became widely known as an earnest, fearless and eloquent preacher. He published ‹Sermons Preached in Saint George's›; ‹Reasonableness of Faith› (1902); ‹A Preacher's Story of His Work› (1904); ‹Reasonableness of the Religion of Jesus› (1913), etc.

**RAINY LAKE,** Canada, between Lakes Superior and Winnipeg, forms part of the boundary between Canada and the United States. It is very irregular in form, but about 55 miles in northeast by southwest dimensions, and mostly three to five miles wide. It receives the waters of numerous small lakes from the east and northeast, and empties itself by Rainy River, about 90 miles long, into the Lake of the Woods.

**RAISED BEACHES.** See BEACHES, RAISED.

**RAISIN,** the commercial name for the dried or cured grape. In Europe the raisin product comes largely from Italy and France, and in the United States almost wholly from California. See RAISIN INDUSTRY, THE.

**RAISIN INDUSTRY, The American,** is confined almost wholly to California. The raisin crop comes from the great San Joaquin Valley and from several counties in southern California. The California raisin grape culture began to be of commercial importance in 1874, when the output was 9,000 boxes, or 180,000 pounds of raisins. The industry advanced «by leaps and bounds» up to 1894, when the crop amounted to 103,000,000 pounds. The markets «broke» under this great output, and the crop sold for less than two cents per pound. As a result there was a sharp decline both in the acreage and in the output of raisins during the next four or five years. However, the growers protected themselves and their market by forming, in 1898, a Raisin Growers' Association, which controlled about 90 per cent of the yield. It had under contract in 1917, 155,000 acres of grapes. This association still continues to handle the bulk of the raisin crop, and has been quite successful in distributing to the best advantage the large output in the different markets. As a result the California raisin industry has had a phenomenal growth. It prospered because of the war since raisins are such a convenient and satisfactory fruit for shipping. Nearly all the raisins of the United States come from 11 counties of California, and 60 per cent of the product is from Fresno. The California product of raisins was : 1913, 130,000,000 pounds; 1914, 182,000,000 pounds; 1915, 256,000,000 pounds; 1916, 264,000,000 pounds.

Of the 1916 product 178,000,000 pounds were Muscats, and 47,000,000 Thompson's Seedless. Before 1896 the United States was a large importer of raisins. From 1887 to 1891 the average importation was 38,500,000 pounds; from 1892 to 1896 the average was 17,746,000 pounds; it is now negligible, and a large export trade is developing. In 1914 the exports were 14,766,000 pounds of the value of $998,000; in 1915 the export was 24,895,000 pounds valued at $1,719,000; and in 1916, 75,014 pounds, of the value of $5,407,000. The raisins are packed and graded into layers, and one, two and three crown loose. The processes of curing, seeding and packing raisins have been improved from time to time, and to-day machines do much of the work formerly done by hand. The first great device was a patent seeder, and the latest one is a raisin-packing machine, by which the packages, or cartons, are filled, weighed and sealed.

The leading varieties of grapes used for raisins are the Muscat and Thompson's Seedless. Grapes are ripe by the middle of August, and the season often lasts into November. The average time of drying and curing a tray of raisins is about three weeks, all depending on the weather. The earliest picked grapes dry in 10 days, and the later ones often take four weeks and even more. The method of drying is very simple. The bunches are cut from the vines and placed on shallow trays two feet wide, three feet long, and one inch high, on which the grapes are allowed to sun-dry, being turned from time to time by simply placing an empty tray top side down on the full one, then turning both over, and taking off the top tray. After the raisins are dried they are stored away in the sweat boxes until they are packed and prepared for shipment. Some of the larger growers, in order not to run so much risk in drying on account of rain, and also to enable them to handle the crop fast enough, have curing houses, where the curing is finished after having been partially done outside. The seeding, grading, packing and shipping have become separate branches.

**RAISIN RIVER, Battle of.** See FRENCHTOWN, MICHIGAN, BATTLE OF.

**RAJA**, rä'jä, or **RAJAH**, a title of hereditary princes of the Hindus. The Hindustani form is rai, and it has also been rendered ras, rana and rawal. Before the subjugation of the country by the Moguls the various countries of Hindustan were governed by rajas, who belonged to the Kshatriyas or military caste. They were sometimes independent rulers and again feudatory, and the highest title, «Maharaja,» was given to those who controlled other sovereigns. The title is now usually merely honorary and is not confined to any caste, while those retaining some degree of actual authority under the British are now designated «Maharaja.» Consult Foy, ‹Die königliche Gewalt nach den altindischen Rechtsbüchern› (1895); Jolly, ‹Recht und Sitte› (1896).

**RAJAMANDRY**, rä-jä-măn'drē, or **RAJAMAHENDRI**, India, a town of the Godavari district, Madras, on the east bank of the Godavari (here three miles wide), 30 miles from the sea. Among buildings and institutions are the courthouse and judge's residence, churches, mission of the American Evangelical Lutheran Church, provincial college, several schools, museum, dispensary, public garden and large prison. Pop. 30,408.

**RĀJATARANGINĪ**, rä'ja-ta-rän'gē-nē (Sanskrit «Stream of Kings»), a Sanskrit chronicle of the kings of Kashmir, written by Kalhana about the middle of the 12th century. The history is written in eight cantos and has about 8,000 verses. It is remarkable as the only work in Sanskrit literature, yet discovered, with any historical value. The work makes use of earlier writings now lost and the first six books cover the period commencing with traditional history of early times down to the reign of Sangrama Déva, 1006; two later books, believed to be the work of Kalhana, bring the history down to the reign of Singha Deva, about 1156. The existence of the work first became known to Mohammedans in 1588, when during Akbar's invasion, a copy was given to the emperor. An edition was published in the Sanskrit text (Calcutta 1835); the text and translation by Troyer (Paris 1840, 1852); and there are translations by Datta (Calcutta 1898) and by Stein (Westminster 1900).

**RAJMAHAL**, răj-ma-häl', India, on the eminence overlooking the Ganges, 170 miles northwest of Calcutta, for many years capital of Bengal. It is now noteworthy only for its palatial ruins, and as a station in an important transit trade. The range of hills on which it stands bears the same name. These hills include a plateau with an area of 1,366 miles and support a population of hillmen or «Paharias,» numbering about 75,000. The sides of the plateau are unusually steep and ascent is made largely by artificial stone steps. Consult Bradley-Bist, ‹Story of an Indian Upland› (1905).

**RAJON**, rä-zhôn, **Paul Adolphe**, French etcher: b. Dijon C. 1842; d. Anvers, 8 June 1888. He was trained at the École des Beaux Arts at Paris, and in 1865 produced his first etching after Meissonnier ‹Rembrandt at Work.› His many subsequent works won for him the leading position among French etchers, and on visiting England in 1872 he found his reputation had preceded him and was commissioned to make an etched copy of John Stuart Mill's portrait by George Frederick Watts and of Tennyson's portrait by the same painter. He was eminently successful in these and other portrait etchings, but his most ambitious and brilliant work was ‹The Emperor Claudis› after Alma Tadema.

**RAJPUTANA**, räj-poo-tä'na, India, a western political division, lying between 18 native controlled states and two chiefships. It consists of Sind and the Junjab; together with the British enclave of Ajmir-Merwara. The total area of the native states is 127,541 English square miles; or including the British district of Ajmir-Merwara, 130,462 square miles. The maharajas and rajas are supreme in their own states, and settle disputes among themselves in courts of their own. A great portion of the surface of Rajputana is desert, and part of it wholly destitute of inhabitants, water and vegetation. The whole of the soil is remarkably saline, containing many salt lakes, and much of the well-water is brackish. The rainfall is scanty, and the region frequently suffers from famine. In many places it is covered with the cactus and other prickly shrubs; except in the Aravalli Hills which traverse the region from southwest to northeast, the territory is almost destitute of trees. Where practicable, pastoral and agricultural pursuits occupy the people. Conditions have slightly improved since British enterprise has opened up the country by a transversal line of railroad, with diverging branches, connecting with the rest of the Peninsular Railway system. The chief town is Jaipur (Pop. 137,000); other urban centres are Bikanir, Jodhpur Bhartpur, Udaipur and Tonk. While the chiefs are of Rajput origin, the Rajput element is in the minority among the population, which consists chiefly of Hindus, with Mohammedans, Animists and Jains. Pop. 10,530,432.

**RAJPUTS**, räj-poots', a people of India, giving their name to Rajputana (q.v.), and said to be a branch of the Kshatriyas, one of the four great castes into which the Hindus were originally divided. They are essentially a military people, and many of their institutions bear a strong resemblance to the feudal customs which prevailed in Europe in the Middle Ages. They are celebrated for their chivalrous spirit in marked contrast to the usual effeminacy and duplicity of many of the Oriental nations. The practice of female infanticide, however, at one time was prevalent among them, until suppressed by British influence; the profuse use of opium has likewise in many cases produced a lamentable deterioration in their physical and moral state. Notwithstanding these drawbacks the Rajput character contains much that is noble and generous. The Rajputs became first connected with the British government under the governorship of the Marquis of Wellesley, in the beginning of the 19th century. They number about 700,000. Besides Rajputana, the Rajputs are numerous in Sind and Guzerat.

**RÁJSHÁHI,** räj-shä'hē, India, a division or commissionership of Bengal, extending from the Ganges to Sikkim and Bhutan. Area, 17,351 square miles; pop. about 8,489,788. The district of Rájsháhi, forming part of the division, has an area of 2,330 square miles; a population of about 1,400,000. The capital of the division and district is Rámpur Beauleah.

**RÁKÓCZY,** rä'kōt-sē, a Transylvanian princely family now extinct in the male line. They were for some time rulers of the principality of Siebenbürgen, or Transylvania, and by a rigorous maintenance of the civil and religious rights of the inhabitants made their influence over their subjects such as to render them formidable to the power of the royal house of Austria. The first prince of the name was SIGISMUND RÁKÓCZY, who obtained the government in 1606, but abdicated in favor of Gabriel Bathori in 1608. His son, GEORGE RÁKÓCZY (b. 1591; d. 24 Oct. 1648), assumed the sovereignty in 1629 and regained for his subjects many lost privileges. He was succeeded by his son GEORGE II (b. 1615; d. 8 July 1676), who attempted an invasion of Poland, was defeated and forced to abdicate, but regained his authority. He died after having been again forced to resign. His son, Francis I, never reigned, but was implicated in various political complications and the last of the family to hold sovereign power was his grandson, Francis II (q.v.).

**RÁKÓCZY, Francis II,** Transylvanian prince: b. 27 March 1676; d. Rodosto, Turkey, 8 April 1735. His attempts to free his country from Austrian rule resulted in his being sentenced to death for high treason, but he contrived to escape, rallied the Hungarians to his support and was proclaimed protector. The alliance of certain of the Hungarian states with Austria afterward caused his defeat and he resigned his estates and went to Turkey. He wrote ‹Mémoirs sur les revolutions de Hongrie› (1738).

**RÁKÓCZY MARCH,** the name of a Hungarian military air by an unknown composer of the 17th century, said to have been the favorite march of Francis Rákóczy II of Transylvania. See NATIONAL HYMNS.

**RALE,** räl (spelled also incorrectly, RASLE, RASLES, and RALLE), **Sebastien,** French Jesuit missionary in North America: b. Franche-Comté, 4 Jan. 1657; d. Norridgewock, Maine, 23 Aug. 1724. In 1675 he became a Jesuit novice at Dôle, in 1677–84 was an instructor at Carpentras and Nimes, and in 1689 was sent to the Canadian missions. For two years he was among the Abenakis near the mouth of the Chaudière in the mission of Saint Francis. Then he passed two years among the Illinois, and finally was placed in charge of the Abenakis of Kennebec. He was believed by the English to be the cause of their difficulties with the Abenakis, and was accused of instigating attacks on the settlements and he was killed during an attack on the village of Norridgewock by New England militia assisted by Mohawks. This is inferred by pro-English historians from a letter to Rale from Vaudreuil, governor at Quebec, expressing satisfaction at Rale's success in uniting the savages against the English, and agreeing to furnish military assistance, should it be required. This communication, dated 25 Sept. 1721, was among papers obtained by the expedition sent out from Boston under Colonel Westbrook to seize Rale in 1721, and is now preserved in the archives of Massachusetts. Among these papers, also, was Rale's dictionary of Abenaki, now in the Harvard library and printed in 1833, in the memoirs of the American Academy of Arts and Sciences. See DUMMER'S WAR.

**RALEIGH,** SIR **Walter,** English military and naval commander, and author: b. Hayes Barton, a farmstead in the parish of East Budleigh, Devonshire, about 1552; beheaded, London, 29 Oct. 1618. He was the son of Walter Raleigh by his third wife, Katharine, daughter of Sir Philip Champernowne of Modbury, and widow of Otho Gilbert of Compton. Raleigh was educated at Oriel College, Oxford; served with the Huguenot army in France in 1569; remained there for five years or more; and, with his half-brother, Sir Humphrey Gilbert, engaged in voyages of «discovery» — and piracy — against the Spaniards in the West Indies. In 1579 he established himself at court in the friendship of men of influence — Leicester, Oxford, Sidney, Walsingham; he served with distinction in Ireland (1580–81); and then, returning to court in December of the latter year, he won, and for some years retained, the high favor of Elizabeth. Through her successive grants of monopolies and estates he became one of the wealthiest of her courtiers. In 1584 he was knighted; in 1585 he was appointed warden of the stannaries (i.e., of the mines of Devon and Cornwall), lord lieutenant of the latter county and vice-admiral of both; and in 1585–86 he was M.P. for Devon. He was also captain of the queen's guard.

From this period, while Raleigh was the favorite of Elizabeth, dates his chief connection with the exploration and settlement of North America. In 1584, '85, '86, '87 and '89, he sent expeditions to Virginia; but as the Queen forbade his personal participation, his efforts to colonize were unsuccessful. Raleigh's services against the Spanish Armada, 1588, were not conspicuous. He assisted in organizing the land forces, but there is no proof that he took any part in the sea-fighting. In 1591 and 1592 he was prominent in the preparation of squadrons for service against Spain, but was recalled from the latter expedition because of the queen's anger at Raleigh's intrigue with one of her maids of honor, Elizabeth Throgmorton. He was soon set at liberty and his marriage to Elizabeth Throgmorton followed. Not until 1597, however, did Raleigh regain the queen's favor.

Meanwhile he was free to explore America in person. His objective point was Manoa, a city supposedly situated in South America and possessed of untold wealth. In 1595, with a fleet of five vessels, he captured the town of San Josef, Trinidad, and explored the Orinoco for 400 miles. He did not find Manoa; but his brilliant service in the English attack upon Cadiz (June 1596) and as commander at the taking of Fayal (1597) completed his restoration to favor. In 1597 he was made M.P. for Dorset; in 1601 for Cornwall. In 1600 he was appointed governor of Jersey.

SIR WALTER RALEIGH

The death of Elizabeth, however, occasioned a change in Raleigh's fortunes. Raleigh's enemies had made James believe that Raleigh was opposed to his accession. James immediately deprived him of all offices, and on 17 July 1603 committed him to the tower. On November 17 he was tried for treason. According to modern rules the evidence was insufficient, but Raleigh was declared guilty and was sentenced to be executed on 11 December.

On 10 December, however, he was reprieved and committed to the tower. Here for 13 years he lived in tolerable comfort with his wife, son and personal servants. He devoted himself to study and to scientific experiments, and, at the request of Prince Henry, began his chief literary work, the ‹History of the World.› At length, in March 1616, on his promise to guide an expedition to a gold mine in America, Raleigh was released. The Spanish Ambassador, fearing an invasion of Spanish possessions or an attack on the Mexican plate-fleet, protested. The king, however, warning Raleigh that either act would be punishable by death, allowed him to proceed. Raleigh ignored the warning, captured San Tomás, and, failing to reach the mine, was kept from attacking the plate-fleet only by the refusal of his followers. On Raleigh's return to England, Gondomar, the Spanish Ambassador, demanded his immediate execution. Raleigh's admissions and perjuries left the king's commissioners no choice. On 28 October the justices of the King's Bench ordered Raleigh's execution under the suspended sentence of 1603. He was executed in the Old Palace Yard 29 Oct. 1618.

Of Raleigh's poetry, so highly praised by his contemporaries, but little was published during his life and much is probably lost. Many poems once attributed to him are now attributed to others. The poems, certainly his, have been collected by Dr. Hannah, 1885. Of Raleigh's prose works, the most important is his ‹History of the World› (1614).

**Bibliography.**— The chief lives of Raleigh are those of William Oldys (1736); Thomas Birch (1751); Arthur Cayley (1805); Patrick Fraser-Tytler (1833); Edward Edwards (1868); J. A. St. John (1868); and Mr. William Stebbing (1891). That by Mr. Stebbing is the best. There is also a popular sketch by Mr. Edmund Gosse (1886). Consult also Mr. S. R. Gardiner's ‹History of England,› and the publications of the Hist. MSS. Comm., and, concerning Raleigh's literary work, the introduction to Dr. Hannah's edition of his ‹Poems› (1885), the bibliographies of Dr. Brushfield, and his ‹Sir Walter Raleigh and His History of the World› (1887). Among more recent works are Selincourt's ‹Great Raleigh› and biographies (1914) by Marshall and Towle.

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**RALEIGH,** SIR **Walter,** English author and educator: b. 1861; d. Oxford, 13 May 1922. He was educated at University College, London, and King's College, Cambridge, and was for many years professor of modern literature at University College, Liverpool. In 1900 he was appointed to the chair of English language and literature at Glasgow University; and after 1904 held the chair of English literature at Oxford University. He was knighted in 1911 and elected a Fellow of Merton College in 1914. He published ‹The English Novel› (1894); ‹Robert Louis Stevenson› (1895); ‹Style› (1897); ‹Milton› (1900); ‹Wordsworth› (1903); ‹Shakespeare› (1907); ‹The English Voyagers› (1904); ‹Six Essays on Johnston› (1910); ‹Romance› (1917).

**RALEIGH,** N. C., city, capital of the State; county-seat of Wake County, in lat. 35° 47' N., long. 78° 84' W., on the Southern, Norfolk-Southern and Seaboard Air Line railroads, about 28 miles southeast of Durham, 148 miles northwest of Wilmington and 60 miles northeast of Pinehurst. Population (1920) 24,418.

**Topography.**— Raleigh occupies an elevation of 363 feet. It is just northeast of the geographical centre of the State, in the upper valley of the Neuse River, which flows southeast to Pamlico Sound. The city, planted around a beautiful park of four acres, which is called Capitol Square, is divided into four sections by four broad streets, which extend from this centre. The magnificent oak trees in Capitol Square give Raleigh the popular name of «City of Oaks.»

**Manufacturing.**— Raleigh has 67 manufacturing plants which turn out cotton goods, yarns, hosiery, underwear, boilers, structural iron works, agricultural implements, vehicles, cotton oil and fertilizers, phosphate, school supplies, books and printing generally, building supplies, monuments, street paving materials, washboards, candy, ice, dairy products, and woodenware. Cotton products for 1922 were valued at $1,341,454.05. In 1923 there were three tobacco warehouses in Raleigh, the first of which was established in 1921. In 1922 over 3,000,000 pounds of tobacco were sold. Over 50 periodicals and newspapers are published in eight large printing houses. Employees in this industry (men and women) number 340. The value of the products (1922) was $1,228,500.

**Buildings and Cemeteries.**—The State capitol, a substantial granite structure, stands in Capitol Square; nearby are the Supreme Court Building, the State Library, State Geological Museum, Raney Library, Agricultural Building, State Departments Building, State Office Building, State Highway Building, Governor's Mansion, Post Office, Wake County Court House and the Raleigh Auditorium (seating capacity of 5,000). Other prominent public buildings are the County Home, State Insane Asylum, State Penitentiary, State School for the Blind, State School for the Deaf Mutes (colored), Saint Luke's Home for Old Ladies, Confederate Home, and the State Experimental Station. There are also National and Confederate cemeteries. The National Cemetery contains 1,207 graves, 572 of which are unknown dead.

**Education.**— The educational institutions are the Peace Institute (Presbyterian), Saint Mary's School for Girls (Episcopal), Meredith College (Baptist), Saint Nicholas School for Small Boys (Episcopal), Sacred Heart Academy (Catholic), Shaw University (Baptist, colored), Saint Augustine School (Episcopal, colored), North Carolina State College of Agriculture and Engineering and King's Business College. There are graded and normal schools for white and colored pupils. A large number of white teachers each year attend the State College Summer School. Not far from the city are the

State University at Chapel Hill and Wake Forest College (Baptist) at Wake Forest. The Supreme Court Library contains 21,375 volumes, the State Library 44,529 volumes, and the Olivia Raney Library 17,160 volumes. All the religious denominations have handsome churches for both races. There are two orphanages, one under the auspices of the Methodist Church and the other in charge of the Catholic Church.

**Banks and Finances.**— There are two National banks, two State banks and three savings banks, also one bank operated by colored persons. The bank resources for 1921 were $25,326,215.06. The building permits for 1921 were $2,336,140. The assessed valuation was $37,057,170.

**Government.**— The city is governed under the commission charter of 1912 which provides for a mayor and two other commissioners elected every two years. The administrative officials are chosen by the mayor and commissioners.

**History.**— The site of the present city was selected in 1792 by the Legislature for the location of the State Capital. In the same year the city was founded and named in honor of Sir Walter Raleigh (q.v.). In 1794 the legislature held its first session in Raleigh. The city was incorporated in 1795 and in 1803 was reincorporated. It was occupied by General Sherman during part of 1865. Consult Battle ‹Early History of Raleigh.›

SIMMS A. JAMIESON,
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**RÂLES**, sounds heard in the respiratory passages, due to certain modifications in the normal structure of the bronchi or alveoli, or both. Sounds that originate in the pleural cavity are distinguished as friction sounds. Râles are new sounds, not common to healthy lungs, and are created either in the bronchi, bronchioles, air-vesicles or pathological cavities. They are due to a number of causes, the most frequent of which are (1) the passage of air through narrowed bronchi, such narrowing being the result of inflammation of the mucous membrane or of muscular spasm, and (2) the passage of air through or by a certain amount of fluid, either mucus, pus, blood-serum or combinations of these. Râles of the first type are dry; those of the second are called wet. The dry râles are usually musical, and on placing the ear to the chest, where they are present, one hears either high-pitched whistling sounds, sibilant râles or low-pitched, blowing or sonorous râles, depending on the source of the sound, whether finer or larger bronchi. Both types may commingle. Such râles are common in asthma, in the chronic bronchitis of emphysema and in the early stages of a bronchitis, before the exudation of mucus has begun. The moist râles are usually of two kinds: (1) very fine or subscrepitant râles, resembling in sound the rubbing of a lock of hair between the fingers, and (2) larger mucous râles. The former are common in various types of disease in which the air-vesicles are involved, bronchopneumonia, lobar pneumonia, tuberculous pneumonia, etc. They are due to congestion and the pouring out of blood-serum into the area. The most mucous râles are present in bronchitis. They occur in the larger bronchi, or in cavities, and resemble the bubbling and gurgling sounds of water in a pipe. It requires the trained ear of the physician to distinguish between the different varieties, and much experience to be able to prejudge the significance of the râles after they are heard.

**RALPH, James**, American author: b. Philadelphia, Pa., about 1698: d. Chiswick, Surrey, England, 24 Jan. 1762. He was a clerk to a Philadelphia conveyancer, and in 1724 went to England with Benjamin Franklin, who praises him as «ingenious» and «extremely eloquent.» As an actor, editor and newspaper writer he was not successful. He then became a teacher in Berkshire, and was welcomed as an adherent of the Prince of Wales' party, which he supported by pamphlet, poem and newspaper contribution. Afterward bought into silence, he received a pension on the accession of George III. Pope ridicules «a thing of his, entitled ‹Night,› a poem,» in the lines of the ‹Dunciad,›

" Silence ye wolves! while Ralph to Cynthia howls,
And makes night hideous — Answer him, ye Owls!"

Franklin pathetically complains that he «did his best to dissuade Ralph from attempting to become a poet»; but apparently Pope was more effective. Ralph's ‹History of England during the Reigns of King William, Queen Anne and George I› (1744) is valuable for the information it contains.

**RALPH, Julian**, American author: b. New York, 27 May 1853; d. there, 20 Jan. 1903. At 13 he began newspaper work as typesetter and later engaged as reporter at Red Bank, N. J. From here he removed to Webster, Mass., to edit *The Times* of that place, and thence to New York, where he came into prominence in reporting the Beecher trial in 1875. He shortly engaged with the New York *Sun* and held a position on its staff for 20 years. He was in the East during the Chinese-Japanese War in 1894 reporting that struggle and traveling in many parts of Asia. Returning to London he joined the foreign staff of the New York *Journal* and reported the Turkish-Greek War, Queen Victoria's Diamond Jubilee in 1897, and the crowning of the Tsar of Russia. The outbreak of the Boer War found him again a field correspondent, attached to the commands of Lords Roberts and Methuen. He returned to America in 1902 and continued his work of special correspondent up to the time of his death. He had a wide knowledge of affairs and a picturesque and vivid style. Some of his books are ‹On Canada's Frontier›; ‹Our Great West›; ‹Chicago and the World's Fair›; ‹People We Pass›; ‹Alone in China›; ‹An Angel in the Web›; ‹At Pretoria›; ‹War's Brighter Side›; ‹The Making of a Journalist.›

**RALPH IRON.** See SCHREINER, OLIVE.

**RALPH ROISTER DOISTER**, a play by Nicholas Udall. It was the first English comedy, although not printed until 1556, and probably written about 1540. At this time its author was head master of Eton, and the comedy was written for the schoolboys, whose custom it was to act a Latin play at the Christmas season. An English play was an innovation, but ‹Ralph Roister Doister› was very successful. It follows Terence and Plautus, Ralph, «a swaggering simpleton, a feeble, conceited fop of the days of Henry VIII,» having his prototype in the ‹Miles Gloriosus.› It is in rhyming couplets, interspersed with songs.

In recent years it has been produced at Tufts College, Medford, Mass.

**RALSTON,** râl'stòn, **William Ralston Shedden,** English Russian scholar: b. London, 4 April 1828: d. there, 6 Aug. 1889. He was the son of W. P. Ralston Shedden and educated at Cambridge. During the period of his college years his father entered upon a litigation to obtain possession of some Ayrshire property and in this effort dissipated his whole fortune. The name of Shedden becoming somewhat notorious in connection with the suit, the son adopted the additional surname of Ralston; and obtained a post at the British Museum in 1853. He gave his attention to the study of Russian, a language then little known. He published 'Kriloff and His Fables' (1868), a translation of Turguénieff's 'Liza' (1869); 'Songs of the Russian People' (1872), and 'Russian Folk Tales' (1873). He made several journeys to Russia and became the life-long friend of Turguénieff, and was also made a corresponding member of the Imperial Academy of Sciences of Saint Petersburg. He projected an exhaustive history of Russia, but did not publish it. In 1874, however, he published his Oxford Taylorian lectures, 'Early Russian History.'

**RAM, Thomas,** English bishop: b. Windsor, 1564; d. Dublin, 24 Nov. 1634. He was educated at Eton and Cambridge, and in 1599 accompanied Essex to Ireland, and in the following year was made dean of Cork. On 2 May 1605 he was consecrated bishop of the united sees of Ferns and Leighlin. Ram was a careful bishop, constantly resident, and did what he could to maintain schools, but the recusant clergy excommunicated all who used them. He was one of the 12 bishops who, 26 Nov. 1626, signed a protest against tolerating popery.

**RAM, Battering.** See BATTERING-RAM.

**RAM, Hydraulic.** See HYDRAULICS.

**RÂMA,** rä'mạ, in Hindu mythology the name common to a personage appearing as three incarnations of Vishnu (q.v.), all great warriors of surpassing beauty. These three forms are distinguished as Bala Râmâ or Balaram, Parasurama or Parasram. and Râmâ Chandra or Dasrat Râmâ. Râmâ first appeared in the sixth incarnation, and his deeds are celebrated in a poem called the 'Râmâyana,' the best great epic poem of ancient India. In this poem all three of the heroes are celebrated, but the last-named, or Râmâ Chandra, has his life and deeds detailed at greater length than the others. The story tells how Sita, his wife. was carried away to Ceylon by the king of demons, one Ravana, and how Râmâ rescued his wife, bridging the water between Ceylon and India by the aid of an army of monkeys. He slew the demons and became a great hero. The Râmâyana is often likened to the 'Iliad,' to which it bears great resemblance. See SANSKRIT LANGUAGE; SANSKRIT LITERATURE.

**RAMADAN,** rä-mä-dän', or răm-ạ-dăn', the ninth month in the Mohammedan calendar, has 30 days. Since the Mohammedan year is a lunar one, Ramadan comes at all the seasons, being eleven days earlier each year. In about 33 years the month has made a complete cycle of the year. Ramadan is important chiefly because it is supposed to be the month in which Mohammed received his divine revelation and is therefore made a month of solemn observance among the faithful. During the 30 days the true believer abstains, between dawn and sunset, from all eating, drinking, smoking; bathing and all other delights of the body are likewise forbidden. The more devout of the Mohammedans remain behind closed blinds during the day and devote themselves to prayer and to reading the Koran, and particularly Sura, in the second book of which are found the references to the fast of Ramadan. There are special prayers, 20 in number, which during this month are added to the usual evening prayers, repeated at dusk by the true believer. Ramadan is also the month in which the Turkish government usually takes occasion to institute reforms, or to promise to institute them, apparently to curtail the national expenses and lighten the tax burden, and generally to undertake those measures that tend to popularize the government with its subjects.

The fast of Ramadan terminates each day with nightfall, and as the Mohammedan keeps the letter rather than the spirit of the law of the Koran, the nights of this month are filled with feasting, the more joyous because of the abstinence during the day. These repasts often become wild revels, or even flagrant debauches, which last until daylight, when the glutted participants once more betake themselves to fasting and prayer. Following the fast of Ramadan for three days there is celebrated the feast of the *Lesser Beiram,* during which all labor ceases and the Mohammedans give themselves to all sorts of table enjoyments. Consult Huart, C. I., 'Histoire des Arabes' (Paris 1912).

**RAMALEY,** răm'ạ-lĭ, **Francis,** American botanist: b. Saint Paul, Minn., 16 Nov. 1870. He was graduated at the University of Minnesota in 1895, and was assistant instructor in botany there in 1894–98. Since 1899 he has been professor of biology at the University of Colorado; and also director of the Mountain Laboratory, Tolland, Colo., since 1909. He has contributed articles on botany and public health to technical journals and is author of 'Wild Flowers and Trees of Colorado' (1909); 'Prevention and Control of Disease' (1913).

**RAMAYÂNA,** rạ-mä'yạ-nạ. Like almost all Hindû masterpieces the Ramayâna also is very lengthy. It has 24,000 distichs. It is well authenticated that Vâlmìki, the poet, wrote the chief part of this epic; minor additions are by unknown authors. The theme treats of Râma. It tells at great length of the abduction of Râma's wife, Sîtâ, by an evil spirit, Râvana, who took her to his cave, Lankâ, in Ceylon, and whence Râma, aided by the cunning ruler of the monkeys, Hanûman, finally carries her off into safety. At a much later date, and probably due to priestly inspiration, an addition is made to the poem in which Râma becomes an incarnation of the god Vishnu. This simple tale is enormously elaborated and spun out to unreasonable and at times tedious lengths by various means, such as the injection of extraneous matter, fairy tales, anecdotes, animal fables, and so forth, until it acquired its present formidable length of nearly 50,000 lines, many of them of 11 syllables, others of 13 and 15. Parts of the Ramayâna indeed resemble in their mechanism quite closely that of the 'Arabian Nights,' one story leading to another, often, too, independent tales being capsulated within others. It is quite evident, having due regard to the much greater antiquity of the Ramayana when compared with the 'Arabian Nights,' that the latter drew largely on the first book for pattern and substance. As to the meaning of the chief part of the Ramayana, it has been held by former scholars that it stands for a historical allegory, but now it is conceded by preponderance of opinion that it is merely an elaborated fragment of prehistoric Hindu mythology. It is more than likely that the main incidents and the kernel of the poem are of remoter origin than the oldest portions of the Mahâbhârata. It is also quite within the bounds of possibility that Ramayana, as well as Mahâbhârata, first existed in oral versions, recited at great sacrificial feasts and similar gatherings, before being reduced to writing and acquiring a settled form. This, too, would account more readily for the varying forms these poems assumed. Indeed, there is a Hindu tradition that the Ramayana was first chanted by Kusa and Lava, the sons of its principal hero. When making a comparison with Sakuntala, it would appear that Ramayana is of distinctly inferior quality so far as poetical standards go. In Ramayana there is frequently a tendency of 'piling Ossa on Pelion,' of great extravagance of diction. On the other hand, there is greater coherence of story. The French translation of Ramayana by A. Fauche (Paris 1863) is the best and the summary by Monier Williams (London 1863) is also good.

**Bibliography.**— Dutt, R., 'The Epic of Rama, Prince of India' (London 1899); Hopkins, E. W., 'The Great Epic of India' (New York 1901); Jacobi, 'Das Râmâyana' (Bonn 1893); Ludwig, 'Ueber das Râmâyana und die Beziehungen desselben zum Mahâbhârata' (Prague 1894); Roussel, 'Le Ramayana' (3 vols., Paris 1903-09); Weber, 'Ueber das Râmâyana' (Berlin 1870).

FRITZ VON SCHIERBRAND.

**RAMBAUD**, rän-bō, **Alfred Nicholas**, French historian and statesman: b. Besançon, 2 July 1842; d. 1905. He was educated at the Ecole Normale; in 1871 became professor of history at Caen and in 1875 was transferred to the same post at Nancy. In 1879 he became secretary to the ministry of public instruction, and in 1881 was nominated to a position in the normal school at Sèvres and shortly afterward made professor of modern history at Paris. From 1896 to 1898 he was Minister of Public Instruction in the Méline Cabinet. His chief works are 'La Russie Épique' (1876); 'Histoire de la Russie' (1878); 'Histoire de la Civilisation Française' (1887); 'Histoire de la Civilisation Contemporaine en France' (1888); in collaboration with M. Lavisse, 'Histoire Générale de la France du IVe Siècle à nos Jours' (1892).

**RAMBERG**, räm'bĕrg, **Arthur**, Baron, German painter: b. Vienna, 4 Sept. 1819; d. Munich, 5 Feb. 1875. He studied art at Hanover and early made a tour in Italy, Hungary and Styria. In 1840 he attended the university at Prague, while at the same time uniting the pursuit of art with his other studies. In 1842 he became a pupil at the Art Academy of Dresden under J. Hübner, and among other early pictures produced by 'Wedding of Dwarfs' after Goethe, and 'The Emperor Henry I on his Hungarian Campaign.' In 1850 he went to Munich and executed a series of genres illustrating the works of Schiller. In 1860 he was appointed professor in the Art School at Weimar, and six years later took a similar position at the Academy of Munich. His subsequent productions include 'The Court of Frederick II in Palermo'; and, among his genres, most notable are his 'Hermann and Dorothea' (after Goethe), and 'Luise,' after the poem of J. H. Voss, which latter was much admired for its brilliancy in design and execution. He also frescoed the walls of Luther's chamber at Wartburg, and for the Grand Duchess of Saxe-Weimar illustrated the tale of the 'King of the Frogs.'

**RAMBERG**, räm'bĕrg, **Johann Heinrich**, German artist: b. Hanover, 1763; d. there, 6 July 1840. He first showed his talent by drawings of scenes in the Harz Mountains. These became known to George III, king of England, his sovereign, as Elector of Hanover, who induced him to go to London, where he provided for him. He remained there nine years, and perfected himself under Reynolds. In 1788 the king sent him to Italy, whence he returned to Hanover, where he was appointed painter to the court. He distinguished himself particularly in humorous drawings, as in his illustrations to 'Reineke Fuchs' and 'Eulenspiegel.' The drawings in the magnificent edition of Wieland's works are all by him; some he etched himself.

**RAMBLER, The.** Though no longer read with the enthusiasm contemporaries formerly accorded it, Johnson's 'Rambler' has at least retained the respect of the thoughtful student of the history of English literature. The essays were distinctly of their day and, like all Johnson's writings, distinctly of their author. They followed the fashion of the periodical literature established by Addison and Steele in adopting ever so wide a field of social and moral conduct as the basis or ingenuity of the author to draw. Temperamentally Johnson was not so well fitted to write the familiar essay as he was for more serious discourse. 'The Rambler' consequently suffers in comparison with the essays of Addison and Steele. A certain dramatic element in characterization appears in 'The Spectator' which is very little present in 'The Rambler.' Johnson created no such personages as Sir Roger de Coverley or Beau Tibbs. The essays are lacking also in variety. One 'Rambler' seems very much like another and though it is scarcely a fair test of them to sit down and read them as a volume, since they appeared periodically and were intended to be read one at a time at intervals, this disadvantage is one that must be faced by all literature of a journalistic character. One has at least to expect that certain portions of such writing shall stand out with sufficient significance to carry the rest along with it. Then again, Johnson's didacticism is presented with a simple directness that seems to have been enjoyed in an age when men suffered moral instruction more patiently than they do to-day. Johnson never sought for ingenious cases of conscience to form the foundation upon which his reflections were based. His didacticism re-much that is of the ethical teaching of the sermon, a characteristic which led some one to propose, humorously, the inclusion of Dr. Johnson's 'Dictionary' upon the high school graduation lists, as a subject for scholarly research. With all these peculiarities, however, there still remains enough in 'The Rambler' to justify the student in giving it a respectful and serious consideration. If the essays never rise to great heights of imagination, they yet never droop or sprawl. Throughout they are characterized by good sense, often by genuinely earnest thought and feeling. Their soundness of tone, their true spirit of moral teaching, is [illegible]. The essays appeared twice a week over a period of two years, and at the end they present [illegible] a remarkable code of conduct, something which is perhaps a good deal better, the rational product of a mind conscious of itself and of its [illegible], and sure of the goodness it seeks to [illegible]. [illegible] Dr. Johnson's literary style, [illegible] the mastery of language [illegible] its apologists. Around the man and the sermon, Dr. Johnson's place is secure [illegible] the English language, and 'The Rambler' will enjoy the partial share of any one who wishes to see how a genius could [illegible] itself to [illegible] and effective expression.

George Philip Krapp,
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**RAMBOUTAN**, ram-boo'tan, the fruit of the tree *Nephelium lappaceum*, of the family *Sapindaceæ*, much grown in the Malayan Archipelago. It is about the size of a walnut, red or a red-yellow, with pulp of a pleasant acid taste. The litchi fruit and longan [illegible] are closely allied species of this genus.

**RAMBOUILLET**, rän-boo-yā, **Catherine de Vivonne, Marquise de**, French social leader: b. Rome, 1588; d. Paris, 2 Dec. 1665. She is popularly [illegible] as the founder of the [illegible] salon, whose [illegible] was [illegible] and [illegible] of Paris, and [illegible] became a literary and political centre. Her salon was developed in opposition to the French royal court, whose vulgar and lax tastes, manners and speech it sought to offset by elegance and refinement in both, and it soon became the rendezvous of intellect and wit. Among the literati, poets and scholars who frequented it were Malherbe, Corneille, Chapelain, Ménage, Vaugelas, Balzac, La Rochefoucauld, Mlle. de Scudéry. Henry IV and Louis XIII were quite indifferent to letters, and in default of royal patronage the Hôtel assumed the rôle of arbiter in matters literary. Its members preserved the original characteristics of the society and pedantry and affectation and incurred the humorous satire of the great Molière in 'Les Précieuses Ridicules' and 'Les Femmes Savantes.' The Hôtel did much to add to the precision and finish of the language and the establishment of good taste, and it was unfortunate that through the Précieuses its name took on the savour of a feminine pedantry. Consult Rœderer, 'Mémoire pour servir à l'Histoire de la Société Polie en France pendant le Dix-septième Siècle' (1835); Brunetière, 'Études Critiques' (3d ed., 1890); Vincent, 'The Hôtel de Rambouillet' (1900).

**RAMBOUILLET**, a breed of sheep. See [illegible].

**RAMEAU**, rä-mō, **Jean Philippe**, French musical composer and theorist: b. Dijon, 25 Sept. 1683; d. Paris, 12 Sept. 1764. Having early acquired some skill in music he joined a company of performers, by whom also he was [illegible] a composition of his own [illegible] in Avignon. He studied [illegible] at Paris, was appointed organist at Clermont Cathedral, and in 1722 made his reputation as a musical theorist by publishing 'Traité de l'Harmonie.' Four years later appeared his 'Nouveau Système de Musique Théorique,' which was followed by his 'Génération Harmonique.' His greatest claim to musical reputation is based upon his dramatic compositions, of which 'Hippolyte et Aricie' appeared in 1733 and was followed by 21 works of grand opera, of which the most popular is 'Castor and Pollux' (1737). In 1750 he published his 'Démonstration du Principe de l'Harmonie,' in which he reduces harmony to one single principle — the fundamental bass, on which he proves all the rest to depend. This work procured him an invitation from the court to superintend the opera at Paris. Louis XV granted him a patent of nobility, and the order of Saint Michael, and in 1764 a statue was raised to him in his native city. Consult Pougin, 'Rameau, Essai sur sa vie et ses œuvres' (1876).

**RAMÉE**, rä-mā, **Louise de la**. See *Ouida*.

**RAMÉE, Pierre de la** (Latin, Petrus Ramus), French humanist and mathematician: b. Cuth, near Soissons, 1515; d. Paris, 26 Aug. 1572. He went to Paris when he was [illegible] years old and gained [illegible] as servant in the College of Navarre, but devoted to self-improvement all the time he could spare. After attending a course of philosophy he was admitted to the degree of M.A., on which occasion he questioned the infallibility of Aristotle. His 'Institutionum Dialecticarum Libri III' (1543), and 'Aristotelicarum Animadversionum Libri XX' raised a storm against him in the university; their publication was prohibited, and certain copies ordered to be burned before the Royal College of Cambrai. Having obtained the patronage of the Cardinal de Lorraine, the prohibition of lecturing imposed in 1543 was withdrawn in 1547, and in 1551 he was appointed professor of rhetoric and philosophy in the Collège Royal at Paris. His spirit of free inquiry ultimately led him to become a Protestant, and he was obliged to flee from Paris, but he unfortunately returned in 1571 and was killed in the massacre of Saint Bartholomew. His works, relating to grammar, logic, mathematics, etc., are numerous. His influence was widely diffused. France, Germany and particularly Scotland, were full of Ramists. His logic was introduced into the University of Glasgow and in the German universities. Consult Waddington, 'Ramus, sa vie, ses écrits et ses opinions' (1855); Lobstein, 'P. Ramus als Theolog' (1878); [illegible] 'Lives of the French Reformation' [illegible].

**RAMENGHI,** rä-mĕng'gē, **Bartolomeo.** See BAGNACAVALLO.

**RAMESES,** răm'ē-sēz, or **RAMSES** (in Egyptian «the Child of the Sun»), the name of several Egyptian kings, especially of the 19th and 20th dynasties, of which the most notable are:

**RAMESES II** (Gr. *Sesostris*), son of Sethos. He was the third king of the 19th dynasty, and reigned 1300–1280 B.C. He made a campaign against Syria and advanced victoriously as far as Berytus (Beirut), on the Phœnician coast of the Mediterranean. He next extended Egyptian dominion over Ethiopia and a part of Arabia and began the cutting of a canal between the Mediterranean and Red seas. But the great event of his reign was his war with the Khita, supposed to be the Hittites. He defeated a confederation, among whom the Khita were the chief, in a great battle near the Kadeshon (Orontes) in Syria, and subsequently took Jerusalem and other places. He fortified the east of Egypt by erecting a great wall from Pelusium to Heliopolis and Tanis. In his reign Thebes rose to great magnificence. Here he erected the splendid temple known as the Rameseum, with a sitting statue of himself more than 60 feet high. The figure of Rameses II at Tanis, parts of which were discovered, was 92 feet high, or with its pedestal 125 feet. It was erect, with the left foot advanced, and probably the tallest of ancient statues. He is the king who oppressed the Hebrews, and the father of Menephthat, under whom the exodus took place. He had 111 sons and 59 daughters, and we have more records and statues of him than of any other Pharaoh. His mummy was discovered near Thebes in 1881 and in 1886 placed in the Egyptian Museum at Cairo.

**RAMESES III,** the Rhampsinitus of Herodotus, belonged to the 20th dynasty, and was also a king of note, some of whose achievements seem to have been ascribed to Sesostris. He reigned 1180–1150 B.C., during which period he had to withstand many invasions of the surrounding nations, but was uniformly successful in war, and active in great undertakings in time of peace. At Medinet-Abu he built a magnificent temple in memory of his warlike achievements in Nubia and Syria. The mummy of Rameses III was found in 1886. Nine other kings of the name of Rameses are mentioned as having belonged to the 20th dynasty (1150–1050).

**RAMESES,** a city of Egypt, in the district of the same name, supposed to be the same as Raamses, one of the treasure-cities built for Pharaoh by the children of Israel during their bondage in Egypt. It was from this point that the Israelites set out in their exodus from Egypt; and its geographical position is therefore of great interest as determining their route toward the Red Sea. The district or «land» of Rameses has been identified by some with Goshen, or a part of Goshen. As for the city, some have supposed it to be in the neighborhood of On or Heliopolis; others somewhere near Old Cairo, on the opposite side of the Nile from ancient Memphis; Dr. Robinson placed it in the valley of Wady Toumilât, toward the east end of that valley, in the line of the fresh-water canal to Ismailia; and Dr. Lepsius thought he had found its site at Tell-el-Maskhuta, in that region. This site, however, has been identified by Naville with Pithom. It is argued in favor of the conjecture which places it in the neighborhood of Memphis, that Rameses must have been near the capital or residence of Pharaoh at the time of the exodus, and as this was Memphis, Rameses must therefore have been near this city. But though Memphis was the ancient capital, it does not follow that the Egyptian king invariably resided there. Tanis or Zoan was also a royal residence, and Brugsch identifies Rameses with it, an identification which suits the biblical narrative quite well. Upon the name of the city is based the theory which identifies Rameses II with the Pharaoh of the oppression.

**RAMESSEUM,** răm-ĕs-sē'ŭm, a temple of ancient Egypt, on the western bank of the Nile, situated opposite Thebes, and near the modern village of El-Kurneh. Its ruins constitute one of the most interesting groups of ancient Egyptian remains, owing to the rich mural sculptures of great historical value which are there preserved. The principal features of the temple were two great courts about 140 feet long by 180 feet wide, entered through a propylon 225 feet wide. The front court contains the fragments of a gigantic statue of Rameses II carved from a single block of granite and estimated to have weighed, when entire, more than 850 tons. The statue was 60 feet high and the monarch was represented as seated on his throne. The columns in both courts are among the most beautiful specimens of Egyptian architecture. On the wall of the second court is a great series of sculptures depicting a battle between Rameses II and the Hittites, in which the king is shown as victoriously pursuing the enemy's forces. Opening on the second court is a beautiful hall of pillars, the walls of which are adorned with battle scenes and religious subjects. A smaller chamber adjacent to the hall of pillars is notable for its astronomical ceiling. The temple was described by Diodorus Siculus under the name of the Tomb of Osymandyas. It is sometimes called the Memnonium.

**RAMESWARAM,** rä-mĕs'wạ-räm, or **RAMESHWARAM,** a low sandy island between the southern extremity of India and Ceylon, and between the Gulf of Manaar and Palk Strait, about 14 miles long and five wide. It is one of the islands that form the chain known as Adam's Bridge, and contains a famous Hindu temple of Dravidian architecture, which attracts many pilgrims from all parts of India. The port of the island is Pambam; it also contains a small town called Rameswaram. There is a passage for ships of moderate size between this island and the continent. Pop. 17,854.

**RAMIÈ, RHEA,** or **CHINA GRASS,** *Bœhmeria tenacissima* and *B. nivea.* Shrubs, five to eight feet high, producing in the bark of their stalks or stems a bast fibre. Technically ramiè and rhea are derived from *tenacissima* and China grass from *nivea.* This distinction has never been regarded, however, in the economic literature of the subject, the term ramié being commonly used to designate all *Bœhmeria* fibre, China grass being either a synonym or the trade name of the Chinese fibre as imported. In the statements which follow, therefore, ramiè and China grass may be considered as synonymous terms, referring to the fibres of both species, as they are practically identical from the standpoint of commercial utility, and as regards culture, preparation and manufacture.

The fibre is strong and durable, is least affected by moisture of all fibres and takes first rank as a textile substance. It is adapted to the widest range of uses of any known textile. It has been made into stuff goods for men's wear, ladies' dress goods, upholstery, curtains, laces and embroideries. The pile of velvets and plushes, stockings, underclothing and knit goods, table damask, napkins, handkerchiefs, shirtings, sheetings, sail duck, carpets, cordage, fishing nets and yarns and threads of all descriptions, and it makes a superior bank-note paper. It is also used to adulterate silk and for imitation silk goods. The plant has been the subject of experiment in nearly every country in the world, and probably millions of dollars have been spent or wasted, in attempts to exploit the industry, or in the construction of machines to extract the fibre. Yet the fact remains that the commercial fibre is produced only in China and by rudest hand methods, Japan coming the nearest to establishing a commercial industry for the production of export fibre. Ramiè is neither grown nor to any extent manufactured in the United States, though its culture was experimented with for years, and inventors and textile manufacturers have struggled with the machine problem and with the after preparation and the spinning of the fibre. As far as this country is concerned the fact that the Chinese fibre can be laid down in San Francisco for about four cents a pound condenses the entire ramiè situation into a nutshell. Cultivation in this country would not pay at such prices, and there is not a machine in existence that could produce enough marketable fibre in a day to pay for the cost of running the machines when American wages are considered.

Ramiè manufactures have been on the market for years, derived from European sources, and made from raw fibre produced in China. And many manufactures made in whole, or part, from ramiè are sold as something else, because the fibre is unknown to the public, or because it is used as an adulterant, as in silk fabrics. See CHINA; CORDAGE; FIBRE; HEMP.

Consult 'Report on Rhea Fibers (Watson 1875); Bulletin Royal Kew Gardens; Dictionary Economic Products of India; Reports (1, 2 and 7) Office of Fibre Investigations, Department of Agriculture; also the French publications of Favier, De Landtsheer, Michatte, Roux, Ringlemann, and the ramiè literature published by the Ministry of Agriculture of France.

CHAS. RICHARD DODGE.

**RAMILLIES**, rä-mē-yē, a village of Belgium, in the province of Brabant, 13 miles north of Namur and 28 miles southeast of Brussels. On 23 May 1706 the Duke of Marlborough gained here a signal victory over the French under Marshal Villeroi and the Elector of Bavaria. The numbers were about 60,000 on each side; the loss of the allies was about 4,000 men, that of the French 15,000. The consequence of this battle was the immediate evacuation by the French of the chief strongholds in the Netherlands. It was again the scene of severe fighting in 1914. See SUCCESSION WARS; WAR, EUROPEAN.

**RAMMAN**, räm'măn, or **RIMMON**, a deity worshipped by the Babylonians and sometimes called also Hadad. He was the god of the all-pervading atmosphere, especially of the winds. In this respect he may be likened to the Meeruts, or storm gods of northern India, for his name is derived from a Babylonian word meaning «loud sounding» or «bellowing.» In the Bible «the House of Rimmon» is spoken of as his temple at Damascus (2 Kings v, 18). He is symbolized by the bull; is the god of storms and floods and of the charge of battle and is represented armed with thunderbolt and battle-axe. Consult Baethgen, 'Beiträge zur semitischen Religionsgeschichte' (1902); Jastrow, 'Religion of Babylonia and Assyria' (1898).

**RAMMOHUN ROY**, räm-mō-hŭn' roi, Hindu religious reformer: b. Burdwan district, province of Bengal, India, 1772; d. Stapleton Park, near Bristol, England, 27 Sept. 1833. He was a Brahman of strict education, but early renounced the polytheism of Brahminic theology. For five years he was dewan, or principal native officer in the collection of the revenues, in one of the districts of East India Company's services. He afterward studied Latin, Greek and Hebrew. A careful study of the sacred writings of the Hindus had convinced him that the prevailing religious notions of the Hindus were grounded upon a gross perversion of their religion, the original records of which appeared to him to inculcate a system of pure theism. He now became anxious to reform the creed and practice of his countrymen, and determined to devote his talents and his fortune to this undertaking. A work of his in Persian on 'The Idolatry of All Religions' aroused much protest. In 1814 he went to live in Calcutta, where as early as 1818 he had united a number of intelligent Hindus in a species of monotheistic worship. He translated the Vedanta, a compendium of the doctrines contained in the Vedas or ancient sacred books of the Hindus, from the Sanskrit into the Bengali and Hindustani languages, and distributed the translation gratuitously. This he afterward published in English, for the purpose of proving to his European friends «that the superstitious practices which deform the Hindu religion not having to do with the pure spirit of its dictates.» From the perusal of the New Testament he found (he says) the doctrines of Christ more conducive to moral principles, and better adapted for the use of rational beings, than any other which had come to his knowledge. In 1820 he accordingly published the 'Precepts of Jesus the Guide to Peace and Happiness,' consisting chiefly of a selection of moral precepts from the Evangelists, and Unitarian in its character. On 23 Jan. 1830 he founded at Calcutta the Brahmiya Somaj, from which was derived the Brahamo Somaj.

Rammohun Roy, in his doctrinal views, was a Unitarian, holding, however, the pre-existence and superangelic dignity of Christ, and considering the doctrine of the Trinity as a species of polytheism. He believed possible a combination of Brahminism and Christianity. His views were at first much misunderstood in

England, and it appears that even Bishop Heber regarded him as an atheist. In 1830 he went to England in the character of ambassador from the king of Delhi (who gave him the title of Rajah). Consult Carpenter, ‹A Review of the Labors, Opinions and Character of Rajah Rammohun Roy› (1833); Fox, ‹Discourse on Occasion of the Death of Rajah Rammohun Roy› (1833); Max Müller, ‹Biographical Essays› (1883).

**RAMONA.** ‹Ramona› (1884), by Helen Hunt Jackson, was written to carry forward an indictment already begun in the author's ‹Century of Dishonor› (1881) against the treatment of the Indians by their white conquerors. ‹Uncle Tom's Cabin› comes at once to mind, but the two books have little in common besides an analogous intention. Mrs. Jackson romantically eluded the problem by making Ramona, the heroine, and her Temecula husband, Alessandro, so near to high-caste Mexicans in color and nurture that their wrongs as Indians seem untypical of the real grievances of their unfortunate race. They suffer little more from the invading Yankees than do the full-blooded Mexicans. Indeed, the true conflict and injustice occur between the old Californians, Indian or Spanish, and the predacious vanguard of the Anglo-Saxon conquest. California, for Mrs. Jackson, was a splendid paradise of patriarchal estates in vast fertile valleys, steeped in a drowsy antiquity, and cherished by priests as unworldly as Saint Francis. Against this rich background she set a story which begins in peace, blackens to hard and ugly tragedy and then grows at the end into peace again. The pomp of the setting, the strength of the contrasts, the eloquence, the intensity, the passionate color dominate, almost submerge, the problem stated, but they tend also to lift it into the higher regions of the imagination in which particular acts of injustice take on the large significance of universality.

CARL VAN DOREN.

**RAMPION,** a biennial herb (*Campanula rapunculus*) of the family *Campanulaceæ*. It grows about 30 inches tall, has a parsnip-like root, obovate leaves, lilac flowers in a spike or raceme, and very small seeds. It is a native of Asia, Europe and northern Africa, where it is cultivated for its roots and leaves, the former of which are used like radishes, the latter like spinach. The plants do best in light, rich loam, partially shaded and well supplied with moisture but not wet. Since early spring sown plants are likely to run to seed, other sowings should be made in early summer. The plant is less popular in America than abroad.

**RAMPOLLA,** răm-pōl'lä, **Mariano,** MARQUIS DEL TINDARO, Roman prelate: b. at Polizzi, Sicily, 17 Aug. 1843; d. 1913. Born of an aristocratic family he was educated at Rome and took priest's orders at 23. Several years later he entered diplomacy and was made secretary to the Papal nunciature at Madrid. During the absence of the Nuncio Simonei in 1876 he acted so brilliant a part during the Carlist war as to secure his appointment as secretary of the Congregation of the Propaganda. In 1885, being then Papal Nuncio at Madrid, he proposed Pope Leo XIII as arbitrator in the dispute between Spain and Germany regarding the Caroline Islands. In 1887 he was created cardinal and made papal secretary of state, which post he held until the appointment of the new Pope Pius X in 1903. The foreign policy of the Vatican was influenced by him and consisted of a conciliatory attitude toward France together with an opposition to the Triple Alliance, with the ultimate end in view of reestablishing the temporal power of the Pope. Upon the death of Leo XIII, Cardinal Rampolla was one of the most prominent candidates to the succession. Austrian interests opposed him and when Pope Pius X was elected, Rampolla resigned as secretary, being succeeded by Cardinal Merry del Vall (q.v.).

**RAMPUR,** răm-poor', India, (1) capital of a state of the same name, on the left bank of the Kosila River, in Central India. It is the residence of the nawab, who represents the Rohilla chieftain of Rohilkhand. A lofty mosque is a specimen of oriental magnificence. The place is famous for its damask, sword-blades and jewelry. Pop. 78,758. (2) The state under the superintendence of the government of the United Provinces has an area of 893 square miles. Pop. 533,212. (3) A smaller Indian town, capital of Bashahr, in southeastern Kashmir, formerly famed for its shawl manufactures. Pop. 7,945.

**RAMSAY,** răm'zĭ, **Allan,** Scottish poet: b. Leadhills, Lanarkshire, 15 Oct. 1686; d. Edinburgh, 7 Jan. 1758. The death of his father in early life forced him to seek a means of livelihood in the Scottish capital. There he became bound as an apprentice to a wig-maker, which occupation he continued after his apprenticeship had ceased. The exact period when he commenced bookselling is unknown, but he is said to have been the first who established a circulating library in Scotland. The library continued to exist till a comparatively recent period. His first shop, as we learn from the imprint of some of his books, was «at the sign of the Mercury, opposite to Niddry's Wynd»; but in 1726 he removed to a house at the east end of the Luckenbooths and adopted for his sign the heads of Ben Jonson and Drummond of Hawthornden. In 1721 he published a collection of his poems which was so liberally subscribed for that he is said to have cleared by it 400 guineas. These poems had originally appeared on separate broadsheets and sold for a penny each. In 1724 the first volume of ‹The Tea-Table Miscellany,› a collection of songs appeared, which was soon followed by two others. Shortly afterward he brought out ‹The Evergreen, being a Collection of Scots Poems wrote by the Ingenious before 1600,› which was equally successful. In 1725 appeared his famous pastoral, ‹The Gentle Shepherd.› Its success was instantaneous and edition followed edition with great rapidity. In 1728 a second quarto volume of his poems appeared; and his ‹Thirty Fables,› undoubtedly the best of Ramsay's lesser productions. He was now at the height of his celebrity and his shop was the common resort of the literary characters and wits of Edinburgh. He spent the last 12 years of his life in a quaint house he had built on the north side of Castle Hill, although he did not give up his shop until within three years of his death. He was buried in Greyfriars' Churchyard, where a monument has been erected. Another monument, erected in 1865, stands in Princes' Street Gardens. Consult ‘Life’ by Smeaton (1890); Graham, ‘Scottish Men of Letters in the 18th Century’ (1901).

**RAMSAY, Allan,** Scottish portrait painter, son of the preceding: b. Edinburgh, 1713; d. Dover, 10 Aug. 1784. He studied art in London and in Italy and by 1758 had achieved a high reputation. George III appointed him principal court painter. Walpole regarded some of his portraits of women superior to Reynolds'. He painted portraits of Gibbon, Chesterfield, Hume, Rousseau and many others, now in the National Portrait Gallery and the gallery at Edinburgh. The portrait of George III preserved at Independence Hall, Philadelphia, is his work.

**RAMSAY, Sir Andrew Crombie,** Scottish geologist: b. Glasgow, Scotland, 31 Jan. 1814; d. Anglesey, England, 9 Dec. 1891. In 1841 he joined the geological survey, with which he was connected until 1881. He became professor of geology at University College, London, in 1848; was lecturer at the School of Mines, 1851; president of the Geological Society, 1862, and director-general of the Geological Survey and the Museum of Practical Geology, 1872–81. He was popular as a lecturer and held the theory that many lake basins are the result of glacial excavations. As a geologist he devoted himself to stratigraphy to the exclusion of palæontology and petrography. His works include ‘Old Glaciers of North Wales and Switzerland’ (1860); ‘The Physical Geology and Geography of Great Britain’ (1872), etc.

**RAMSAY, Andrew Michael** (CHEVALIER RAMSAY), Scottish scholar: b. Ayr, Scotland, 9 June 1686; d. Saint Germain-en-Laye, France, 6 May 1743. He was educated at the universities of Edinburgh and Saint Andrews and being deeply interested in theological matters he went to Leyden where he formed a friendship with the mystic Poiret through whom he visited Fénelon, archbishop of Cambrai, in France, in 1710. The latter took a deep interest in Ramsay, succeeded in converting him to the Roman Catholic faith and kept him with him until his death in 1715, when he bequeathed to Ramsay his papers. Ramsay then became tutor to the Duc de Château-Thierry and subsequently acted in the same capacity to the sons of the Pretender, Francis Edward, at Rome. He visited England in 1730, was elected to the Royal Society and on his return to Paris became tutor to the Vicomte de Turenne. His writings were published in excellent French, but though of considerable merit and very popular in his day, are now rarely read. They include ‘Essai Philosophique sur le Gouvernment Civil’ (1721); ‘Vie de Fénelon’ (1723); ‘Poems’ (1728); ‘L'Histoire du Vicomte de Turenne’ (1735), etc.

**RAMSAY, David,** American physician and historian: b. Lancaster County, Pa., 2 April 1749; d. Charleston, S. C., 8 May 1815. He studied medicine and practised in Charleston, where he soon acquired celebrity. He was a field-surgeon in the Continental army, was elected to the State legislature in 1776, was a prisoner of the British in 1780–81 and in 1782–86 served in the Continental Congress, acting as president in 1785–86. He was a member of the South Carolina legislature in 1801–15 and was president of the State senate when he was killed by a lunatic. He labored zealously with his pen to promote the cause of the American independence and among his publications are ‘The History of the American Revolution’ (1789); ‘The Life of Washington’ (1807); ‘The History of South Carolina’ (1785); ‘Universal History Americanized, or an Historical View of the World, from the Earliest Record to the 19th Century’ (12 vols. 1816–17), etc.

**RAMSAY, Francis Munroe,** American naval officer: b. Washington, D. C., 5 April 1835; d. 19 July 1914. Appointed midshipman in 1850; graduated from the United States Naval Academy in 1856, and in the Civil War participated in the engagements at Haines' Bluff, Yazoo River, Milliken's Bend and later commanded the gunboat *Unadilla* of the North Atlantic Squadron. He was superintendent of the United States Naval Academy in 1881–86, was promoted rear-admiral in 1894, served as chief of the Bureau of Navigation in 1889–97, and in the latter year was retired on reaching the age limit.

**RAMSAY, Nathaniel,** American soldier: b. Lancaster County, Pa., 1751; d. 25 Oct. 1817. He was graduated from Princeton in 1767, studied law, was admitted to the bar in 1771, and in 1776 entered the Continental Army with rank as lieutenant-colonel. He greatly distinguished himself at the battle of Monmouth in 1778, when he with Colonel Stewart checked the advance of the British while Washington rallied the main army. He was severely wounded, taken prisoner and held until 1780 when he was shortly afterward retired. With the exception of 1786–87, when he was a member of Congress from Maryland, he saw no further public service.

**RAMSAY, Sir William,** Scotch chemist, nephew of Sir A. C. Ramsay, the geologist: b. Glasgow, 2 Oct. 1852; d. 23 July 1916. He was educated at Glasgow and Tübingen, was assistant in the «Young» chemical laboratory 1872–74, and at Glasgow University 1874–80, and after seven years as professor of chemistry at University College, Bristol (six as its principal), and from 1887–1913 was professor of chemistry at University College, London. A member of most of the royal academies, philosophical, physical and chemical societies of the world, he won his chief repute for his study of rare gases and their discovery; with Lord Raleigh in 1894 he discovered argon (q.v.) and alone isolated helium, krypton, neon and xenon (qq.v.). In the investigation of the nature and properties of radium he took a prominent part, and in November 1903 claimed that he had proof that helium is the gaseous emanation of radium (q.v.). In 1904 he was awarded the Noble prize in chemistry. He was created K.C.B. in 1902 and was an officer of the Legion of Honor and of the Prussian order *Pour le Mérite.* He wrote ‘The Gases of the Atmosphere, the History of their Discovery’ (1896). Consult Tilden, Wm. A., ‘Sir William Ramsay’ (1918).

**RAMSAY, Sir William Mitchell,** Scottish archæologist and historian: b. Glasgow, 15 March 1851. He was educated at the universities of Aberdeen, Oxford and Göttingen, was Oxford traveling student in 1880 and from that date onward has traveled extensively in Asiatic Turkey. In 1885 he was appointed to the chair of classical archæology at Oxford, and since 1886 has been professor of humanity (Latin) in the University of Aberdeen. He has made a special study of the geography and topography of Asia Minor, and among his works are 'The Historical Geography of Asia Minor' (1890); 'The Church in the Roman Empire before A.D. 170' (1893), dealing with Saint Paul in Asia Minor and the early persecutions of the Christians; 'The Cities and Bishoprics of Phrygia' (1895–97); 'Saint Paul the Traveler and the Roman Citizen' (1895); 'Impressions of Turkey' (1897); 'Was Christ Born at Bethlehem?' (1898); 'Historical Commentary on the Epistle to the Galatians' (1899); 'The Education of Christ' (1902); 'The Letters to the Seven Churches of Asia' (1905); 'Pauline and Other Studies in Early Church History' (1906); 'The Cities of Saint Paul' (1907); 'The Revolution in Constantinople and Turkey' (1909); 'Pictures of the Apostolic Church' (1910); 'The First Christian Century' (1911); 'The Teaching of Paul in Terms of the Present Day' (1913); 'The Making of a University' (1915).

**RAMSDEN,** rămz′dĕn, **Jesse,** English mechanist and optician: b. Halifax, Yorkshire, 6 Oct. 1735; d. Brighton, Sussex, 5 Nov. 1800. He was apprenticed to a cloth-worker, but subsequently applied himself to engraving and in the course of his employment having to engrave several mathematical instruments, finally constructed them himself. He opened a shop in the Haymarket, whence he removed to Piccadilly, where he remained until his death. Ramsden obtained a premium from the Board of Longitude for the invention of a machine for the division of mathematical instruments. He also improved the construction of the theodite, the pyrometer for measuring the dilation of bodies by heat, the barometer for measuring the height of mountains, the refracting micrometer and transit instrument and quadrant. He made great improvements in Hadley's quadrant and sextant, reducing the limits of error from 5 minutes to 30 seconds; and procured a patent for an amended equatorial. He was chosen a Fellow of the Royal Society in 1786, and such was his reputation that his instruments were bespoken from every part of Europe. He received the Copley medal from the Royal Society in 1795 in recognition of the importance of his various inventions.

**RAMSEUR,** răm′sėr, **Stephen Dodson,** American soldier: b. Lincolnton, N. C., 31 May 1837; d. Cedar Creek, Va., 19 Oct. 1864. He was graduated from West Point in 1860 and was assigned to garrison duty at Fortress Monroe. At the outbreak of the Civil War he resigned from the United States army to enter the Confederate service with rank as major of artillery. He served in the Peninsular Campaign, was later attached to «Stonewall» Jackson's command, performed gallant service at Chancellorsville and at Gettysburg in his capacity of brigadier-general and was conspicuous for bravery in the battle of the Wilderness. In 1864 he received temporary rank as major-general, was engaged in the Shenandoah campaign and was fatally wounded at the battle of Cedar Creek, where he was captured while covering the retreat of the Confederate forces.

**RAMSEY,** răm′zĭ, **Alexander,** American politician and Cabinet officer: b. near Harrisburg, Pa., 8 Sept. 1815; d. Saint Paul, Minn., 22 April 1903. He took a partial course at Lafayette College (Easton, Pa.), studied law at Carlisle, Pa., was admitted to practice in 1839; in 1841 was elected chief clerk of the Pennsylvania house of representatives and in 1843–47 was a Whig representative in Congress. In 1848 he was chairman of the Whig State committee, and on 2 April 1849 was appointed governor of Minnesota, established as a Territory 3 March 1849. He concluded treaties with the Ojibways and Sioux in 1851, and a second treaty with the Ojibways in 1863. In 1855 he became mayor of Saint Paul, in 1859 was elected governor of the State of Minnesota, being the Republican candidate for the first State campaign, and by re-election held the post until his resignation 10 July 1863. He then served in the United States Senate two terms, ending in 1875. While in the Senate he visited France in the effort to secure a cheaper rate of international postage. In 1879–81 he was Secretary of War in Hayes' Cabinet. He was a leading spirit of the Minnesota Historical Society, of which he was the first president (1849–63). He was the first Civil War governor to offer volunteers to Lincoln.

**RAMSGATE,** rămz′gāt, England, on the Isle of Thanet, in the county of Kent, 65 miles east by south of London, is a seaport and popular seaside resort. It is situated in the valley between chalky cliffs and has a fine stretch of sandy beach. The chief places of interest are the theatre, music-hall, assembly-room, iron promenade pier and churches. There is an excellent harbor, extensive bathing establishments; of historical interest are an ancient Anglo-Saxon graveyard on Ossengal Hill, about one mile from the town; Pegwell Bay, the landing place of Hengist and Horsa, and Cliffs' End, where a cross marks that of Saint Augustine. There is some shipbuilding, rope-making and a considerable fishery. Pop. 29,603.

**RAMUS,** rā′mŭs, **Petrus.** See Ramée, Pierre.

**RANA.** See Frog.

**RANAVALONA III** (also written **RANAVALO**), last queen of Madagascar: b. 1864. She succeeded her aunt, Ranavalona II, in 1883, and in that year married the Prime Minister, Rainilaiarivony, who had been prince consort to her aunt. She was only nominally queen, as the government had been controlled by the Prime Minister since 1864. The French succeeded in establishing a protectorate over the island in 1895, but Ranavalona retained a nominal sovereignty until 1897, when the island was declared a French colony and the queen was deposed and exiled to Algeria.

**RANC,** räṅk, **Arthur,** French politician and author: b. Poitiers, 20 Dec. 1831; d. 10 Aug. 1908. He was educated at Poitiers; studied law in Paris; became involved in the disorders of the Democratic party, was arrested and deported to Africa. Returning to Paris after the amnesty of 1859, he contributed to the *Courier du Dimanche,* the *Nain Jaune,* the *Journal de Paris* and other journals. For certain articles written for the *Nain Jaune* he was imprisoned for four months. Under Gambetta he became director of police and in 1871 was elected to the National Assembly, but owing to his disagreement with the arrangements for peace he resigned and was elected a member of the Commune. He resigned from that body on account of its violence. In 1873 he again became a member of the National Assembly. Later he was impeached for the part he had played during the Commune, and in 1875, during his absence in Belgium, was condemned to death *in contumaciam.* The amnesty of 1879 allowed his return to France, and in 1881 he became deputy from the Seine and in 1891 a senator. He succeeded Clemenceau as editor of *L'Aurore* and was later president of the Association of Republican Journalists. He wrote a political romance, ‹Sous l'Empire› (1872), also ‹De Bordeaux à Versailles› (1877); ‹Le Roman d'une Conspiration› (1868).

**RANCAGUA,** rän-käg'wä, Chile, the capital of the province of O'Higgins, 50 miles by rail south of Santiago. It is an agricultural centre with an active domestic trade. The Spaniards here won an important victory over the revolutionary forces in 1814. Pop. 10,380.

**RANCÉ,** rän-sā, **Armand Jean le Bouthillier de,** founder of the reformed order of La Trappe: b. Paris, 9 Jan. 1626; d. 26 Oct. 1700. At 11 he was appointed canon of Notre Dame, and at 13 wrote a commentary on the Odes of Anacreon. After being graduated at the Sorbonne, he was ordained priest (1651) and before long was preferred to no fewer than six benefices. Residing at Paris, in receipt of a large income in addition to his private fortune, he gave himself up to a life of dissipation. In 1657, however, a change took place in his manner of life, and he determined to enter the cloister. He disposed of his estate of Veret, near Tours, applying the proceeds to religious purposes, and demitted all his benefices except the priory of Boulogne and the abbey of La Trappe. Retiring to the latter place in 1664, he began the strictest reforms. (See LA TRAPPE). In consequence of his growing infirmities he resigned his charge of the abbey in 1695. Consult Marsollier, ‹Vie de Rancé (1703); Gaillardin, ‹Trappistes› (1844); Pfannenschmidt, ‹Geschichte der Trappisten› (1873).

**RANCHING,** a term derived from the Spanish-American word «rancho,» originally meaning a place where herdsmen eat and sleep, but gradually extended to mean a grazing farm. One who owns or operates a ranch is a rancher or ranchman, or in Mexico a ranchero. Some of these ranches are of vast extent, especially in Old Mexico and in South America, where they are termed haciendas, and include hundreds of square miles. In Texas, Colorado and other Western States and Territories, also, there are very large ranches, from which come the supplies of cattle for the American and foreign markets. With the growth of population there has been a marked reduction in great individual holdings of land, but some of the cattle-farms are still very extensive. The cattle are herded by a mixed class of men known as cowboys, which includes students from college, rough and honest frontiersmen and others with a record that has driven them from places where they are better known. The cowboys round up the cattle once or twice a year, when the steers three years old are separated from the main herd and sent to market, and the calves are branded. The cattle of the ranches have been much improved within recent years by crossing with domestic breeds. It was chiefly from the cowboy element that President Roosevelt recruited his Rough Riders for the Spanish-American War.

**RAND, Edward Kennard,** American philologist: b. Boston, Mass., 20 Dec. 1871. He was graduated at Harvard in 1894 and later studied at the University of Munich, and the Episcopal Theological School at Cambridge, Mass. He was instructor in Latin at the University of Chicago in 1895–98, and occupied that position at Harvard in 1901–05, becoming assistant professor in 1905, and since 1909 he has been professor of Latin there. He is Harvard trustee of the American Academy at Rome, and in 1912–13 he was annual professor there. Author of articles on classical and mediæval subjects and joint author of ‹Dante's Alagherii Operum Latinorum Concordantiæ› (1912). He also wrote ‹Ovid and the Spirit of Metamorphoses› (1912).

**RAND,** ränd, contraction of **WITWATERSRAND,** South Africa. See WITWATERSRAND; TRANSVALL COLONY.

**RANDALL,** răn'dạl, **Alexander Williams,** American statesman: b. Ames, N. Y., 31 Oct. 1819; d. Elmira, N. Y., 25 July 1872. He studied law, was admitted to the bar and in 1840 established a law practice at Waukesha, Wis. He was appointed postmaster there and in 1847 was a member of the convention which framed the State constitution. In 1855 he was elected to the State legislature, was judge of the second district in 1856, and in 1857–61 was governor of Wisconsin, rendering important aid in raising troops for the Union army. In 1861–62 he served as Minister to Italy, was Assistant Postmaster-General in 1862–66 and Postmaster-General in 1866–69. He then retired from public life and engaged in law practice at Elmira until his death.

**RANDALL, George Morton,** American military officer: b. Ohio, 8 Oct. 1841; d. 14 June 1918. At the outbreak of the Civil War he entered the Union army as second lieutenant. He received steady promotion, was distinguished for gallantry at Antietam and Petersburg, and was mustered out of the volunteer service in 1865 with the rank of lieutenant-colonel. He was commissioned captain in the regular army in that year, promoted colonel in 1890 for gallant services in the Indian warfare in Arizona in 1873–74; commissioned brigadier-general of volunteers at the outbreak of the Spanish War in 1898, and on the reorganization of the regular army in 1901 received rank as brigadier-general.

**RANDALL, James Ryder,** American journalist and poet: b. Baltimore, Md., 1 Jan. 1839; d. Augusta, Ga., 14 Jan. 1908. He was educated at Georgetown College, D.C., taught for a while in a Louisiana college, and then turned to journalism. In 1861 he wrote ‹Maryland, My Maryland,› a song which when set to music became, next to ‹Dixie,› the most popular of the Confederate war-songs and is considered by many to be the best American martial lyric. None of his other songs achieved the fame of this, but several of them are of notable excellence. Among them are ‹Stonewall Jackson,› and ‹There's Life in the Old Land Yet.› After 1866 he was for many years the editor of the *Constitutionalist* of Augusta, Ga., and later of the *Morning Star* of New Orleans.

**RANDALL, Samuel Jackson,** American statesman: b. Philadelphia, 10 Oct. 1828; d. Washington, D. C., 12 April 1890. Educated in the schools of his native city, he began life as a silk merchant's clerk and later entered into partnership in a firm of wholesale iron merchants. But politics was more attractive to him than business. He served four years as member of the city council and in 1858 was elected to the State senate. He enlisted with the City troop of Philadelphia at the beginning of the Civil War and served under General Thomas' command in the 2d United States Cavalry. He was promoted to orderly sergeant, then quartermaster and finally captain of his company. During the battle of Gettysburg he was advanced to provost marshal. In 1862 he was elected to Congress and was a member of that body for 28 years. The first eight years of his career in Congress were uneventful; but in the 43d Congress he served with Blaine, Garfield, Banks and S. S. Cox on the committee on rules and took the lead in the opposition to the Force Bill in order to defeat its passage as law and secure for himself the leadership of the Democratic party in Congress. He was elected speaker of the House at the second session of the 44th Congress and re-elected by the 45th and 46th; hence it fell to him to preside during the dispute over the Presidential election of 1876. He was not in sympathy with the settlement of the difficulty by means of an electoral commission. Although always a Democrat, he took the opposite view to that of his party on the subject of protection at the period when tariff discussions were uppermost in Congress. He was an indefatigable worker and never shirked the arduous labor of committees, insisting always on economy and honesty in the management of public affairs. Hence he served as an immense safeguard of the national treasury.

**RANDEGGER,** răn'dĕg-gĕr, **Alberto,** Austro-English composer and conductor: b. Trieste, 13 April 1832; d. 1911. He studied pianoforte under Lafont and composition under L. Ricci, and before he was 20 was known as composer of several masses and two ballets. His next work was an opera, ‹Il Lazzarone,› to a libretto by Rossi. He became musical director in various Italian theatres and brought out his second opera, ‹Bianca Capella,› at Brescia in 1854. In that year he removed to London, where he long resided, becoming naturalized. He was teacher and director of the Royal Academy of Music, conductor of Italian opera at Covent Garden and of concerts at Queen's Hall and the Norwich Festival. A comic opera, ‹The Rival Beauties,› was produced in 1864. He was made Knight of the Crown of Italy in 1892.

**RANDERS,** răn'dĕrs, Denmark, in Jutland, capital of the province of the same name, lies at the head of Randers Fjord, about 20 miles from the Cattegat. It is an important port, whose chief exports are butter and eggs; chief imports sugar, petroleum, coal and iron. Its celebrated gloves, its manufacture of hosiery, cutlery, railway carriages, calico-printing works and distilleries are the chief industries. Pop. 22,963.

**RANDOLPH,** răn'dŏlf, **Alfred Magill,** American Episcopal bishop: b. Winchester, Va., 31 Aug. 1836; d. 6 April 1918. He was graduated at William and Mary College in 1855 and at the Virginia Theological Seminary in 1858, and took priest's orders in 1860. He was rector of Saint George's Church, Fredericksburg, Va., 1860–62, chaplain in the Confederate army 1863–65, and rector of Emmanuel Church, Baltimore, Md., 1867–83. In the latter year he was elected coadjutor-bishop of Virginia. In 1892 the diocese was divided and he then became bishop of southern Virginia. He published ‹Reason, Faith and Authority in Christianity› (1902).

**RANDOLPH, Edmund Jennings,** American statesman: b. Williamsburg, Va., 10 Aug. 1753; d. Clarke County, Va., 13 Sept. 1813. He was educated at William and Mary College and afterward admitted to the bar. He was Virginia's first attorney-general, was member of Congress, 1779–82 and governor of Virginia, 1786–88. He was a member of the convention that framed the Federal Constitution though he did not approve or sign the document when completed. However, he urged Virginia to accept it, feeling the necessity of union of the States. He was a leader in the work of codifying the Virginian laws begun in 1788. In 1789 Washington appointed him Attorney-General and in 1794 he succeeded Jefferson as Secretary of State. During the pending of the Jay treaty, Fauchet, the French Minister to the United States, sent home some dispatches to his country which were intercepted by an English ship and through the English Minister were transmitted to Washington. They were kept by the President for eight days before their contents were disclosed to Randolph. Feeling that others had been consulted regarding the matter before he was apprised and that he must consequently be prejudged, he resigned his office after denying the allegations of the dispatches. He retired to Virginia and resumed the practice of the law, but his public career was blighted and his memory bore the stain of the accusations against him until his vindication was presented by Moncure D. Conway in an article ‹A Suppressed Statesman,› in *Lippincott's Magazine* for September 1887, followed by a biography, ‹Omitted Chapters of History Disclosed in the Life and Papers of Edmund Randolph› (1888).

**RANDOLPH, Edward,** British colonial agent: b. England, about 1620; d. West Indies, after 1694. He was sent to New England in 1676 with a governmental commission to obtain information concerning the resources and the general character of the leading men in the colonies. He was also the representative of Capt. John Mason who claimed the ownership of New Hampshire. Randolph's arrogant demands, overriding the charter of Massachusetts, caused Governor Leverett to refuse to recognize him as a royal agent. Randolph, on his return to England after a six weeks' stay, pre-

Randolph

sented a report hostile to the public men of the colonies and greatly exaggerating the population and wealth of the country, in order to afford an excuse for increased taxation. In 1678 he was appointed collector and surveyor of customs for New England. In the nine years of his tenure of office he made eight visits to England, and his misrepresentations were largely responsible for the abrogation of the Massachusetts charter in 1684. He served under Gov. Sir Edmund Andros in 1686–89, and upon the overthrow of the Andros administration he was imprisoned but later was released. He went to the West Indies in 1694, and died there. A complete list of Randolph's reports is given in the ‘Andros Tracts’ (Vol. III).

**RANDOLPH, John,** of Roanoke, American statesman: b. Cawsons, Chesterfield County, Va., 2 June 1773; d. Philadelphia, 24 June 1833. He was of an old and wealthy Virginia family and claimed to be a descendant of Pocahontas. His father died young, and his mother married St. George Tucker, who directed his early education. Later he attended the grammar school of William and Mary College; in 1787 went to Princeton for a few months, and the following session to Columbia College, which ended his academic training. In spite of his protestations of ignorance he was well educated, and wrote and reasoned well. He read law and began to practise, but preferred politics, and in 1799 was elected to Congress on a platform denouncing the Alien and Sedition laws. Randolph was in the House of Representatives 1799–1813, 1815–17 and 1819–25. He was a member of the Senate, 1825–29, and in 1829 was a member of the Virginia Constitutional Convention. In Congress he soon became the leader of the Democratic-Republican opposition, and after the defeat of the Federalists was the leader of the administration party, but soon fell out with Jefferson, and became an independent with a few followers called «Quids.» Throughout his public career Randolph was a consistent, strict constructionist. In his first speech he advocted a reduction of the «mercenary» army; he led in the impeachment (1804–05) of Justice Chase, of the Federal District Court; he denounced the settlement of the Yazoo frauds; and was the enemy of fraud and corruption in every form. Brought up in the midst of war, he hated it, opposing all measures leading to the War of 1812, and his opposition to the administration cost him his seat in 1813. Returned to Congress in 1815, he strongly opposed the national reaction that followed the War of 1812. He disliked slavery, but denounced the Missouri Compromise as a surrender of principles by both sides. He invented the term «dough faces,» as applied to Northern men who made compromise with slavery for reasons of expediency. He supported Jackson for the Presidency, and denounced the Adams-Clay understanding as «a combination of Puritan and blackleg.» A duel with Clay followed (1825), in which Randolph threw away his fire and offered Clay his hand. In 1830 Jackson appointed him Minister to Russia. Resigning because of ill health, Randolph returned to America (1831) and opposed Jackson in the Nullification controversy. Re-elected to Congress in 1832, he died before taking his seat. Randolph was a strange compound of contradictory elements. At times he was a deist; oftener an emotional Christian. He was a far-sighted statesman, an eloquent speaker, a master of satire and vindictive; at times he spoke nonsense. Eccentric and irritable in public, at odds, sooner or later, with all of his associates and colleagues, he was fond of children and was loved by them. By his will he emancipated his 318 slaves, providing for their support. With clearer vision than most of his contemporaries, he foresaw the grave danger to the South from the slavery question in politics and pointed out the course which that section must follow. He was never married, his fiancée, the beautiful Maria Ward, having broken her engagement with him to marry his cousin, Peyton Randolph. An aristocrat, he believed in the democratic theories of the French Revolution, but admired Edmund Burke. In his later years, his mind was affected by disease and the use of drugs to deaden pain, and by domestic troubles. In personal appearance Randolph was tall, very slender, with a dark, keen face and long thin fingers, which he pointed or shook at his opponents when speaking. «Little Jack» was a beautiful boy; John Randolph was an ugly man. Consult Garland, ‘The Life of John Randolph of Roanoke’ (1881); Adams, Henry, ‘John Randolph’ (1882); Trent, ‘Southern Statesmen of the Old Régime’ (1898).

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**RANDOLPH, Peyton,** American patriot, president of the first Continental Congress: b. Williamsburg, 1723; d. Philadelphia, 22 Oct. 1775. He was graduated at William and Mary College and, sent to complete his education in England, studied law at the Temple. In 1748 he became king's attorney for the colony and the same year was chosen a member of the house of burgesses. He was chairman of a committee authorized to revise the laws of the colony, and was among the most active and influential members of the assembly. In 1764 the Virginia house of burgesses voted an address to the king against the passage of the Stamp Act, which Randolph drew up. On 12 April 1766 he was made speaker of the house of burgesses, and resigned his office of attorney-general. In the measures of opposition to the English he now took a conspicuous part. In March 1773, on the reception of copies of an address and resolution from the Massachusetts assembly, Randolph was prominent in urging instant and bold action. In the convention which met in August 1774, at Williamsburg, he presided, and was one of the delegates elected to the Continental Congress appointed to meet in Philadelphia in the following September. On the assembling of that body he was unanimously elected its president. In 1775 he presided over the second convention of Virginia and was speaker of the house of burgesses.

**RANDOLPH, Thomas Jefferson,** American legislator: b. Monticello, Albemarle County, Va., 12 Sept. 1792; d. Edge Hill, Albemarle County, Va., 8 Oct. 1875. He was for several years a member of the State legislature of Virginia, where he introduced in 1832 a bill for the gradual abolition of slavery, and in 1842 another for the reform of the taxes, which was passed, and proved of assistance in placing the State on a sound financial basis. In 1851–

52 he was a member of the convention for the revision of the Virginia constitution, in Civil War time was a firm supporter of the Confederacy and in 1872 presided over the National Democratic Convention which nominated Horace Greeley for the Presidency. He edited the ‘Life and Correspondence of Thomas Jefferson’ (his grandfather) (1829); and wrote also ‘Sixty Years' Reminiscences of the Currency of the United States.’

**RANDOLPH,** Mass., town in Norfolk County, 15 miles by rail south of Boston, on the New York, New Haven and Hartford Railroad. The Boston School for the Deaf is located here. Manufactures include shoes and boxes. Pop. 4,756.

**RANDOLPH,** Vt., town in Orange County, on the Central Vermont Railroad, about 25 miles south by west of Montpelier. The town includes Randolph Centre and North Randolph. It is in an agricultural and lumbering region and its industries are connected largely with farming and lumbering. It has woodenware factories, flour and lumber mills and creameries. Its most noted institution is the Randolph State Normal School. It has a free public library. Pop. of the town, 3,010; of the Centre, 1,819.

**RANDOLPH-MACON SYSTEM OF COLLEGES AND ACADEMIES,** a group of five institutions in Virginia, comprising (1) Randolph-Macon College at Ashland, a college for men; (2) Randolph-Macon Academy at Bedford City, and (3) Randolph-Macon Academy at Front Royal, preparatory schools for boys; (4) Randolph-Macon Woman's College at Lynchburg; (5) Randolph-Macon Institute at Danville, a preparatory school for girls. These institutions are under the control of one board of trustees, which is self-perpetuating. The original institution is the college for men at Ashland, which was established under the auspices of the Methodist Episcopal Church, South, and received its charter from the Virginia legislature in 1830, thus being the oldest Methodist college in America. It was located near Boydton, Mecklenburg County, Va., and opened to students in 1832. The college obtained no permanent endowment until shortly before the Civil War, and was closed during the war. Much of the endowment was also rendered worthless, and the college reopened in 1866 under serious embarrassment. In 1868 its site was changed to Ashland, Va., and since that time its work has been successful and influential. The first of the affiliated schools was the Academy of Bedford City, founded in 1890; the academy at Front Royal was established in 1892, and the woman's college in 1893; the institute at Danville was affiliated with the system in 1897.

The Randolph-Macon College at Ashland offers courses leading to A.B.; B.S., and A.M.; graduation with distinction in four subjects additional to those required for the A.B. and a thesis are required for the degree of A.M. The A.M. courses are elective, and the elective system prevails to a limited degree in the A.B. course. Six students' aid funds are provided, four of which are for ministerial students, and several scholarships, the largest of which has a fund of $10,000. Two literary societies are maintained by the students for literary and oratorical exercises. The buildings include Pace lecture-room building, the chemical laboratory, Duncan Memorial Chapel, the library, the gymnasium, the Pettyjohn Hall of Science and eight large dormitories. The library contains 20,000 volumes. The students in 1923 numbered 200, and the faculty 18. The grounds and buildings are valued at $317,029; the productive funds average about $430,000 yearly, and the income about $72,593.

The Randolph-Macon Woman's College offers courses leading to the degrees of A.B. and A.M. One year of graduate work in courses elected by the student is required for the master's degree. For the A.B. course the work of the first two years is prescribed, the last two years is largely elective; the electives are arranged in eight groups, one course in each group being the free choice of the student. Courses in music are offered; one course in the history of music is open to all college students and counts toward the A.B. degree; and a completion of the course in either piano, organ or vocal music count three hours toward the degree. The college occupies two large buildings, the main building and the Jones Memorial Library; the library contains 15,000 volumes; 654 students were enrolled and 50 instructors in 1923.

**RANDOLPH PLAN,** in American political history, the name given the scheme of a Federal Constitution proposed in the Convention of 1787 by Edmund Randolph of Virginia. It contained 15 resolutions and proposed a correction of the Articles of Confederation; representation by population in two branches of Congress, the first chosen by the people, the second by State legislatures; Congressional control of taxation and commerce; Congressional veto of State enactments; that Congress should choose the executive; that the executive with part of the judiciary should have a limited veto on acts of Congress and other less important provisions.

**RANELAGH,** răn'ĕ-lā, a fashionable London pleasure resort of the 18th century, frequently referred to in English literature. The rotunda built on the model of the Pantheon at Rome accommodated 6,000 persons and stood in beautiful gardens. The grounds are now occupied by the Chelsea Hospital.

**RANGE,** (1) *in gunnery,* the horizontal distance to which a projectile is thrown. Strictly, it is the distance from the muzzle of the gun to the second intersection of the trajectory with the line of sight. The range of a cannon lying horizontally is called the right level or point-blank range; when the muzzle is elevated to 45 degrees it is called the utmost level. (2) *In music,* the whole ascending or descending series of sounds capable of being produced by a voice or instrument; the compass or register of a voice or instrument. (3) *In natural science,* the geographical limits within which an animal or plant is now distributed, and the limits in point of time within whch it has existed on the globe. The first is called range in space and the second range in time. In the case of marine animals, as the Mollusca, there is also a range of depth, as measured by the number of fathoms which constitute their superior and inferior limits. (4) As a nautical term, the length of cable a little in excess of the depth of water, ranged on deck ready to run out when the anchor is let go. Also a large cleat in the waist for belaying the sheets and tacks of the courses. (5) A target range is a place prepared for shooting at a target.

**RANGE FINDER.** See Fortifications.

**RANGELEY** (rānj'lĭ) **LAKES,** in Maine, near the western boundary: one of the lakes, Umbagog, is on the boundary between Maine and New Hampshire. The principal lakes are Umbagog, Richardson, Molechunkemunk, Mooselookmaguntic, Rangeley and Kennebago. A number of small bodies of water are connected with the lakes mentioned and all are joined by short streams. The Rangeley Lakes are at the headwaters of Androscoggin River. They are noted for the wild and picturesque scenery and the abundance of fish and game. The region is a favorite summer resort. Two railroads enter this section, one terminating at the town of Rangeley on Rangeley Lake and the other at Bemis on Mooselookmaguntic Lake.

**RANGER,** rān'jėr, **Henry Ward,** American painter: b. western New York, 1858; d. 7 Nov. 1916. He never attended an academy of art, but traveled through France, England and Holland for several years and was elected associate of the National Academy of Design. Among his pictures are ‘The Top of the Hill’ (in the Corcoran Gallery); ‘East River Idyll’ (in the Carnegie Gallery); ‘Pasture Lot’; ‘Morning at High Bridge’ and ‘Spring Woods’ (in the Metropolitan Museum, New York); ‘Bradley's Mill Pond’ (in National Gallery, Washington, D. C.). Some of his pictures are marines, and as a landscape painter his works are fresh, vigorous and finely colored.

**RANGOON,** rän-goon', Burma, chief town and principal seaport of Lower Burma, on the left bank of the Hlaing or Rangoon River, in the Pegu division, covers an area of 22 square miles, and is populated by Hindus, Mohammedans and Christians. The town occupies a long stretch of high land, incorporating villas whose spacious grounds lend to certain parts almost a rural aspect. The wide streets are virtually boulevards bordered on either side by trees. The modern large town is of recent growth, dating from the British occupation in 1852. Among the buildings may be mentioned the cathedrals, churches, government buildings, town-hall, law-courts, custom-house, hospital schools and colleges and museum. The city enjoys most of the modern conveniences, including a good water supply. There is railway communication with Mandalay and Prome. A large foreign and inland commerce is also carried on by waterways. The main exports are rice and timber, besides raw cotton, precious stones, ivory, horns and a variety of other articles. Cotton and woolen goods, machinery, coal, silk, salt and sugar are imported. The annual exports exceed £10,000,000. Rangoon was built in 1753 by Aloung-Choosa, the founder of the Burmese dynasty, and has since been the scene of many wars between Burmans and Peguans. The British restored it in 1825 to the Burmese, but annexed it in 1852. Pop., including cantonment, 293,316.

**RANJIT SINGH,** rŭn-jēt' sĭng'h', founder of the Sikh kingdom in the Punjab, India: b. Gujranwala, 2 Nov. 1780; d. 27 June 1839. His father was Maha-Singh, sirdar of Sukur Chukeah. He lost both parents before he was 18, and though wholly without education set vigorously about consolidating and extending his power. At 20 he was appointed governor of Lahore by the Afghan Amir and calculated upon the fanaticism of the Sikhs for establishing his power over them. He secured European officers to organize his army, whose steadfastness and religious zeal, Sir William Hunter has compared to the Ironsides of Cromwell. In 1809 he formed an alliance with the English through Charles Metcalfe, defining the Sutlej as the boundary between their respective territories, and to this engagement he always remained loyal. Having removed the danger of English combination with any of his native rivals, he actively pushed forward his conquests until his territory extended to and embraced Múltán on the south, Peshâwar on the west and Kashmír on the north. He obtained from Sháh Shujá, a refugee in Lahore, the Kohinur diamond that had been carried off by Nádir Sháh from Delhi. Dissensions followed his death, as none of his sons was capable of continuing his rule. Consult Griffin, ‘Ranjit-Singh’ (1892); Gordon, ‘The Sikhs’ (London 1904); Burgess, ‘Chronology of Modern India’ (Edinburgh 1913).

**RANK,** in the army and navy, is officially described as «that character or quality bestowed on military persons which marks their station and confers eligibility to exercise command or authority in the military service within the limits prescribed by law.» It is divided into degrees or grades which mark the relative positions and powers of the different classes possessing it. Rank is generally held by virtue of office in an arm of the service, corps or department, but may be conferred independently of office, as in the case of retired officers and of those holding it by brevet. While the President of the United States is technically commander-in-chief, the highest rank in the American army is general; in the navy, admiral. Next to general is lieutenant-general, then major-general and next brigadier-general. In time of peace the highest army officer is usually a major-general, the titles of general and lieutenant-general being bestowed only as marks of special distinction. The same conditions apply to the ranks of admiral and vice-admiral. Until 1917 there had been only four «full» generals in the American army — Washington, Grant, Sherman and Sheridan; and three «full» admirals in the navy — Farragut, David Porter and Dewey. The title of general lapsed with the death of Sheridan in 1888, and under the law of 1911 the rank of admiral ceased on the death of Dewey, 16 Jan. 1917. Besides the four generals mentioned, the rank of lieutenant-general has been held also by J. M. Scofield, Nelson A. Miles, S. B. M. Young, A. R. Chaffee, John C. Bates, H. C. Corbin, A. McArthur and Winfield Scott (brevet). By act of Congress, 22 May 1917, provision was made for the appointment of three admirals and three vice-admirals; and another act, 6 Oct. 1917, revived the title of general for two officers, namely, the chief of staff and the commander of the United States forces in France. The application of both statutes, however, extends to «the existing emergency only» — the European War, the object being to place the American war chiefs on a rank level with that existing among the allied naval and military forces. The relative rank between officers of the army and navy is as follows, lineal rank only being considered: General with admiral; lieutenant-general with vice-admiral; major-general with rear-admiral; brigadier-general with commodore (the latter grade ceased to exist in the United States navy 3 March 1899); colonel with captain; lieutenant-colonel with commander; major with lieutenant-commander; captain with lieutenant; first lieutenant with lieutenant (junior grade), and second lieutenant with ensign. An American general wears on his uniform the United States coat of arms and two silver stars; a lieutenant-general, one large silver star and two small ones; a major-general, two silver stars; a brigadier-general, one silver star; a colonel, one silver spread-eagle; a lieutenant-colonel, a silver leaf; a major, a gold leaf; captain, two silver bars, and a first lieutenant, one silver bar. The naval officers have similar decorations plus an anchor. The lowest military commissioned rank is second-lieutenant; in the navy, ensign. Brevet rank is the title of a rank superior to that actually held, without its pay or emoluments. At the close of the Civil War nearly all colonels, with good records, were brevetted brigadier-generals. See ARMY.

In the British navy and army the relative rank is almost the same except in the two highest grades, where an admiral of the fleet ranks with field-marshal; then admiral with general, etc.

**RANKE**, rän'kė, **Leopold von**, German historian: b. Wiehe, Thuringia, 21 Dec. 1795; d. Berlin, 23 May 1886. His preliminary education at Donndorf and Sculpforta was followed by courses in theology and philology in Leipzig. From 1818 to 1825 he taught classics in the gymnasium at Frankfort, and then became professor of history at Berlin, largely because of the promise of his ‹History of the Roman and Germanic Peoples from 1494 to 1535,› of which the first volume appeared in 1824. His coming to Berlin was the beginning of his study of Venetian history, which was chiefly due to his discovery of the valuable ‹Relations of the Venetian Ambassadors,› a discovery which strengthened his belief in the importance of diplomatic and other documentary material. In 1827 he began the important study of civilization, first entitled ‹Princes and Peoples of Southern Europe in the 16th and 17th Centuries,› and in its revised form called ‹The Ottomans and the Spanish Monarchy in the 16th and 17th Centuries› (1877); and in the years immediately following wrote on the Serbian Revolution (1829); ‹The Conspiracy against Venice in 1618› (1831), and the lectures ‹On the History of Italian Poetry› (1837). To the lectures delivered in 1833 may be dated the rise of the historical school known by his name, which, like the Heidelberg School, was Protestant in sympathy and impulses, but unpartisan in methods; its members include Waitz, best known for his studies of constitutional history, Giesebrecht, who wrote on the German Empire, von Sybel, author of the ‹History of the French Revolution,› von Sybel's pupils, von Noorden and Maurenbrecher, and Dümmler, one of the editors of the ‹Monumenta Germaniæ,› and Dove, Ranke's literary executor and one of the editors of volumes 7–9 of the ‹History of the World.› From 1833 also dates the foundation of the ‹Historisch-Politische Zeitschrift,› edited by Savigny, Ranke and others, and protesting against the extreme liberalism of the revolution of July; as well as the beginning of Ranke's great history of ‹The Roman Popes in the Last Four Centuries› (1834–37; 10th ed. 1900), with its clear outline of the varied political and religious influences at work in Rome and its wonderful grasp of the meaning in a philosophic scheme of ‹World-History› of the Papacy. It was followed and balanced by ‹German History in the Time of the Reformation› (1839–47; 7th ed., 1894), and ‹Twelve (originally Nine) Books of Prussian History› (1847–48; revised 1878–79), thus fulfilling in part his function as Prussian historiographer, a post to which he had been appointed in 1841. He was ennobled by the King of Prussia in 1865, and since 1858 had been president of the Munich Historical Commission. His academic activity ceased in 1871, but his work of research, authorship and revision continued almost to the very day of his death. A monument was erected to him in Wiehe in 1896.

He wrote ‹French History, Especially in the 16th and 17th Centuries› (1852–61); ‹English History in the 16th and 17th Centuries› (1859–67; revised and enlarged 1877–79), and various studies in German history, among which the sympathetic ‹History of Wallenstein› (1869; 5th ed., 1895) should be mentioned. But of the greatest importance as embodying Ranke's philosophical idea of universal history is the ‹History of the World› (1880–88; 5th ed., 1896 seq.), which is marked by thorough research, excellent critical judgment and sharp, clear and felicitous characterization, with a poetical vigor of style.

Ranke's complete works were edited by Dove; volumes 53 and 54 contain valuable autobiographical matter. Consult also Dove's biography in the ‹Allgemeine deutsche Biographie›; sketches by Sybel in ‹Histor. Zeitschrift,› Vol. 56; Prutz, in ‹Unsere Zeit› (1886), and his son F. v. Ranke, in ‹Deutsche Revue› (1903); Lorenz, ‹Ranke, die Generationlehre und der Geschichtsunterricht› (1891); Guglia, ‹Leopold von Ranke› (1893); Ritter, ‹Ranke: Seine Geistesentwicklung und seine Geschichtschreibung› (1896); Nalbandian, ‹Rankes Bildungsjahre und Geschichtsauffassung› (1901).

**RANKIN, Arthur McKee**, American actor: b. Canada, 1841; d. San Francisco, Cal., 17 April 1914. His first appearance on the stage was at Rochester, N. Y., under the name of George Henley. He afterward resumed his own name and in the early '60s made his début in London. In 1870 he appeared in New York with Lydia Thompson. His most famous rôle was in ‹The Two Orphans,› and he was also highly successful in ‹The Danites,› a dramatized version of Joaquin Miller's novel ‹The First Families of the Sierras.› Later he appeared chiefly in Shakesperean rôles. In 1883 he opened Rankin's Theatre in New York.

**RANKIN, Jeannette,** American member of Congress: b. near Missoula, Mont., 11 June 1880. She lived on a ranch until 15; received the degree of B.S. at the University of Montana in 1902, and in 1908–09 was a student at the New York School of Philanthropy. In 1909 she was engaged in social work in Seattle and in the following year was active in the suffrage movement in Washington State, in California in 1911 and in Montana in 1912–14. Her gifts as a campaign speaker made her welcome everywhere and in 1915 she visited New Zealand and worked as a seamstress in order to gain personal knowledge of social conditions. In November 1916 she was elected member at large from Montana to the 65th Congress (1917–19), being the first woman ever elected to the Congress of the United States. She was a senatorial candidate in 1918 but failed of election.

**RANKIN, Jeremiah Eames,** American Congregationalist clergyman and educator: b. Thornton, N. H., 2 Jan. 1828; d. Cleveland, Ohio, 28 Nov. 1904. He was graduated from Middlebury College, Vermont, in 1848 and entered the ministry, serving in various pastorates in Massachusetts, New York and New Jersey. From 1889–1903 he was president of Howard University, Washington, D. C., resigning in the latter year. He was the author of numerous hymns, notably ‹God be with You,› and also published ‹Auld Scotch Mither and other Poems›; ‹Christ His Own Interpreter,› etc.

**RANKIN,** Pa., borough in Allegheny County, on the Monongahela River, eight miles from Pittsburgh, on the Baltimore and Ohio, the Pittsburgh and Lake Erie and the Bessemer and Lake Erie railroads. It is a growing town and manufactures steel and wire. Pop. 6,042.

**RANKINE,** răn′kĭn, **William John Macquorn,** Scottish scientist: b. Edinburgh, 5 July 1820; d. Glasgow, 24 Dec. 1872. He entered Edinburgh University, where he gained several prizes in the department of physics; in 1837 he took up civil engineering and in 1842 published his first book, ‹An Experimental Inquiry into the advantage of Cylindrical Wheels on Railways.› In 1848 he began his researches in the domain of molecular physics, which occupied him at intervals throughout his life and form his chief claim to distinction in the domain of pure science. In 1855 he was appointed to the chair of engineering in Glasgow University, which position he held until his death. He published ‹Manual of the Steam-Engine and other Prime Movers› (1859); ‹Manual of Civil Engineering› (1861); ‹Treatise on Shipbuilding, Theoretical and Practical› (1866); ‹Machinery and Millwork› (1869). Consult memoir by Tait prefixed to his ‹Miscellaneous Scientific Papers› (1881).

**RANNEY, William,** American artist: b. Middletown, Conn., 9 May 1813; d. West Hoboken, N. J., 18 Nov. 1857. He learned drawing in Brooklyn, N. Y., and at the outbreak of the war with Mexico enlisted with the Texans. During the campaign he made sketches from the picturesque southwestern life, and after his return to Brooklyn, elaborated these into oil paintings of great interest, among which may be mentioned ‹Boone's First View of the Kentucky›; ‹On the Wing›; ‹Washington on His Mission to the Indians› (1847); ‹Duck-Shooting› (Corcoran Gallery, Washington); ‹The Sleigh Ride,› and ‹The Trapper's Last Shot.›

**RANOUS, Dora Knowlton,** American writer and editor and translator: b. Ashfield, Mass., 16 Aug. 1859; d. New York City, 19 Jan. 1916. She married William V. Ranous in 1881. She went upon the stage, in the famous Daly Company, in 1879, but retired when she married. When it was necessary to support herself, she became assistant editor in a house that published textbooks. From this she passed to the editing, and to a large extent translating of the works of Maupassant, Daudet, Flaubert, and Disraeli. In collaboration with Rossiter Johnson she edited ‹The Literature of Italy› (16 vols., 1906). She also edited many other works, including an elaborate cable code for the use of missions; and served on the staffs of the *Century Magazine* and the *Standard Dictionary*. She published anonymously ‹The Diary of a Daly Débutante› (1910), and ‹Good English in Good Form› (1916), and contributed many original articles to the ‹Foundation Library for Young People› (1911) and to other publications.

**RANSDELL, Joseph Eugene,** American legislator: b. Alexandria, La., 7 Oct. 1858. He was graduated at Union College in 1882, was admitted to the bar in 1883, and was engaged in practice at Lake Providence, La., in 1883–99, since which time he has been interested in cotton planting. He served in Congress in 1899–1913, and was elected United States Senator for two terms (1913–25). He has been president of the National Rivers and Harbors Congress since 1907, and has also been honorary chancellor of Union College since 1907.

**RANSOM, Matthew Whitaker,** American soldier and legislator: b. Warren County, N. C., 8 Oct. 1826; d. 8 Oct. 1904. He was graduated from the University of North Carolina in 1847, was admitted to the bar the same year and in 1852 was elected attorney-general but resigned in 1855. He entered political life and in 1858–60 served in the State assembly. He was untiring in his efforts to avert the Civil War, but when North Carolina seceded he entered the Confederate army and served with ability through the war, attaining the rank of major-general in 1865. Afterward he resumed his law practice, was elected United States Senator in 1872 and served until 1895, when he was appointed Minister to Mexico and served until 1897 when he returned to the United States and re-engaged in law practice at Weldon, N. C.

**RANSOM, Robert,** American soldier: b. Warren County, N. C., about 1828; d. 1893. He was graduated from West Point in 1850, was breveted second lieutenant of dragoons and served in various parts of the West until appointed assistant instructor of cavalry tactics at West Point. He was made captain of the 1st cavalry 31 Jan. 1861, but resigned on 24 May and entered the Confederate army. He became colonel of the 9th North Carolina Confederate cavalry; in March 1862 was advanced to brigadier-general and on 26 May 1863 to major-general. In 1862 he commanded a brigade and the defenses near Kingston, N. C., and from April to June 1864 the Department of Richmond. He was in command in November 1864 of the sub-district No. 2 of the Department including South Carolina, Georgia and Florida. At the close of the war he became express agent and city marshal of Wilmington, N. C., 1866–67; a farmer in Virginia, 1874–78, and later a civil engineer in the service of the United States in various river and harbor improvements in Missouri and South Carolina.

**RANSOM, Thomas Edward Greenfield,** American military officer: b. Norwich, Vt., 29 Nov. 1834; d. Rome, Ga., 29 Oct. 1864. He was educated at the Norwich University, studied civil engineering and settled in Illinois, where he engaged as a civil engineer and a real estate agent. After the outbreak of the Civil War he became a lieutenant-colonel of volunteers in July 1861, and commanded a regiment at Shiloh in April 1862. He was promoted brigadier-general in January 1863; served under General Banks in the Red River expedition, and later joined Sherman's army, took command of a division just before the capture of Atlanta, 2 Sept. 1864 and died as a result of overtaxing his strength while leading his troops in pursuit of Hood.

**RANSOM** (from Latin, *redemptio*), the sum required to be paid to the captors of a prisoner of war in order to procure his release. The practice of redeeming prisoners of war by a ransom was a very common one not only in ancient times, but in modern times up to the end of the 18th century. As late as 1780 a treaty was concluded between France and Great Britain on the subject of exchange of prisoners, in which the various relations the different ranks bore to each other were specified, together with the sums required to be paid by way of ransom. A French vice-admiral or an English admiral was estimated as of equivalent value in the exchange of prisoners to 60 sailors or private soldiers, as was also a French marshal or an English field-marshal. Ransom is now exacted only by brigands. Prisoners are generally retained until peace is restored, when they are released without ransom, or they may be exchanged during the progress of hostilities. Officers are frequently released during the war on pledging their word of honor to take no further active share in it.

**RANSOME,** răn'sŭm, **Arthur,** English physician: b. Manchester, 11 Feb. 1834. He was educated at Trinity College, Dublin, Caius College, Cambridge and studied medicine in London and Paris. He was lecturer on biology at Cambridge in 1857–61, professor of hygiene at Owens College in 1880–95, became lecturer on phthisis at the College of Physicians in 1890 and is a recognized authority in pulmonary diseases. He has published 'Stethometry' (1876); 'Causes of Consumption' (1884); 'The Principles of Open Air Treatment of Phthisis and Sanatorium Construction' (1903); 'A Campaign against Consumption' (1914).

**RANSOME, Frederick Leslie,** American geologist: b. Greenwich, England, 2 Dec. 1869. He was graduated at the University of California in 1893, and in 1893–95 was Fellow in geology there. Ph.D. University of California 1896. In 1897–1900 he was assistant geologist and since 1900 he has been geologist of the United States Geological Survey. Since 1912 he has been in charge of the sections of western areal geology and metalliferous deposits. He was lecturer on ore deposits at the University of Chicago in 1907 and Silliman lecturer at Yale in 1913. He is president Washington Academy of Sciences, treasurer National Academy and treasurer National Research Council.

**RANTERS,** a term not in use in the United States, but formerly applied in England to the Primitive Methodists, on account of the enthusiasm and earnestness which characterized their worship. While this is the recent application of the word, it was formerly used in the period of the English Commonwealth to indicate an alleged sect whose practices attracted public reprobation and which was suppressed by the authorities.

**RANTOUL,** răn'tool, **Robert, Jr.,** American statesman: b. Beverly, Mass., 13 May 1805; d. Washington, D. C., 7 Aug. 1852. His father, who survived him for several years, was long a member of the State legislature. The son was educated at Harvard where he was graduated in 1826. He studied law in Salem, was admitted to the Essex bar in 1827 and for several years practised in Gloucester, which he represented in the legislature 1834–37, and distinguished himself there as a reformer and an advocate of the rights and interests of the common people. He exerted himself for the abolition of capital punishment and made a report to the legislature on that subject. In 1837 he was appointed a member of the Massachusetts board of education and gave much time and attention to the advancement of the system of public instruction. In 1843 he became collector of the port of Boston and in 1845 was made United States district attorney. In 1851 he was elected United States Senator to succeed Daniel Webster for the short remainder of his term, and having been prominent among opponents of the extension of slavery, the Free-Soilers of his district united with the Democrats in electing him to the United States House of Representatives the same year. A volume of his speeches and writings with memoir appeared in 1854.

**RANUNCULACEÆ,** the buttercup family, composed of herbs and shrubs. There are about 800 species, widely distributed in cold and temperate climates and to a very limited extent in warm ones. All are more or less acrid while fresh, but usually lose this property upon being dried. A few have been reputed poisonous, others have been used in medicine and several for food both for man and animals. The family is, however, chiefly noted for its ornamental species, many of which are widely popular garden flowers. The best known of these genera are probably *Aquilegia, Clematis, Anemone, Delphinium, Helleborus, Pæonia, Nigella, Caltha, Aconitum, Actæa* and *Ranunculus.* (See COLUMBINE; ANEMONE; LARKSPURS; PEONY; CLEMATIS; HELLEBORE). The type genus, *Ranunculus,* which includes about 200 species, is also cultivated. The garden or Asiatic ranunculus (*R. asiaticus*) is a native of western Asia and has been cultivated for about 300 years for its brilliant single or double variously colored flowers. The lesser celandine (*R. ficaria*), a European species, is cultivated for its foliage, which is eaten like spinach and for its tubers, which are served like potatoes. Several species of buttercups, notably *R. acris* and *R. repens*, are well-known weeds in pastures.

**RANZ DES VACHES,** räṅs dā väsh, «the lowing of the cows,» the popular title of the simple melodies which the herdsmen of the Alps in Switzerland sing or play on an instrument called the alpenhorn when they drive the herds. It consists of a few simple intervals, yet capable of producing a very striking effect in the echoes of the mountains. Consult ‹Sammlung von Schweizer Kuhreigen und Volksliedem› (Berne 1818). See NATIONAL HYMNS.

**RAOUL ROCHETTE,** rä-ool rō-shĕt. See ROCHETTE, DÉSIRÉ RAOUL.

**RAOULT,** rä-oo, **François Marie,** French chemist: b. Fournes, Nord, 10 May 1830; d. 1901. He was educated in Paris, where he received the doctorate in physical sciences in 1863. He went to the University of Grenoble to teach chemistry, was made professor in 1870 and dean of the faculty in 1889. In 1890 he was made correspondent of the Academy of Sciences. His researches were first in the field of electro-chemistry; later he turned to the discovery of the freezing-point of a great number of solutions and also the determination of the tension of vapors of volatile liquids.

**RAOUX,** rä-oo, **Jean,** French painter: b. Montpellier, 12 June 1677; d. Paris, 10 Feb. 1734. He painted history, portraits and genre, and during his lifetime enjoyed a great reputation in France and was even elected to the Academy (1717). He has indeed painted some good landscapes in the style of Claude Lorraine, but his historical pictures are stagy and artificial. His portraits are said to have been good likenesses, and he is chiefly known nowadays for his portraits of fine ladies, on whom he bestowed the false and meretricious graces fashionable in his day. Many of his pictures were engraved.

**RAP,** familiar in the phrase «not worth a rap,»a counterfeit Irish coin of the time of George I, which passed for a half-penny, though not really worth a fourth of that value. There was also a small Swiss coin called «rappen,» worth a centime.

**RAPE,** an annual herb (*Brassica napus*) of the order *Cruciferæ.* It is a native of the Old World, where it has long been cultivated for its foliage and its seed, the former of which is an important stock food, the latter a source of coleseed oil. It resembles the turnip in foliage, but grows taller and lacks the turnip-like root. In America it is not grown for its seed at all, but toward the end of the 19th century became an important soiling and forage crop for sheep and beef cattle. It is usually sown after mid-summer upon any good soil, and is especially popular in cool climates because it will stand considerable cold without injury.

**RAPE,** a word derived from German «raffen» and old English «rap,» to seize and carry away, and meaning in law the crime of having carnal knowledge of a woman without her consent and by force. This has always been regarded as one of the highest crimes, and is still punished by death in some American States; in others by long terms of imprisonment. In the case of a female who has reached the age of consent, and who is not an idiot, the element of force is essential to constitute the crime of rape. If consent is obtained by the use of threats which convince the woman that it would be useless to resist, it is not necessary to prove actual violence. It has long been established by court decisions in England and America that deception, as when a married woman is deceived into believing that a man not her husband is her husband, does not constitute rape. Within the past 20 years statutes have been passed in England and most of the United States raising the age of consent for girls. These laws have been of great service in protecting the young and promoting morality.

**RAPE OF THE LOCK, The.** Pope's ‹Rape of the Lock› (1714), a mock-epic of 814 lines in heroic couplets, remains the most famous and perhaps the most finished example of society verse in English. The serio-comic genesis of this brilliant, fanciful and vivacious poem was the very pretty social quarrel that resulted when a certain Lord Petre had stolen a lock of the hair of a Miss Arabella Fermor. Pope's friend Caryll asked the young poet, just then becoming famous, to heal the breach by friendly ridicule. Pope consented, and published his first version of his poem in Lintot's *Miscellany* in 1712. The success of the charming trifle was so great that the poet planned a more elaborate version in the form of the mock-epics then popular in France and England. He conceived the idea of parodying the supernatural machinery of the epic by using the gnomes and sylphs of the so-called Rosicrucian philosophy instead of the classical divinities. These he very appropriately made attendant upon his heroine, and added also a scene of a game at cards and other details. The result justified the revision and elaboration. ‹The Rape of the Lock› as published in 1714 at once took its place as the supreme product of the drawing-room muse.

It does not sparkle so brilliantly after the lapse of two centuries. The heroic style is out of date; the literary parody has lost its significance; the beaux and belles belong to a past age; the dainty filigree work has grown somewhat tarnished. Under all this lies a more fundamental defect: despite Pope's dedication of the poem to Miss Fermor as a tribute to her charms, it is the product of an age and a class that regarded woman as little better than a fool. Even Addison, though urbane and gracious enough, assumes this in his *Spectator* satire; Pope, embittered by his sense of the personal deformity that rendered him unattractive to women, embodies in his clever epigrams implications none too complimentary to the sex. His admiration is feigned; his satire is sincere. But such defects in the poem are counterbalanced by qualities that defy the passing of time and any change in taste and point of view. The story is admirably managed: Belinda's toilet, her trip up the Thames to Hampton Court, the game at cards, the afternoon tea, the rape of the lock itself and the ensuing battle, the anxiety and the intervention of the attendant spirits, are clearly and firmly presented. The preparation, climax and catastrophe are the work of a master craftsman. The verse, with its plenitude of epigrammatic, often stinging, couplets, is polished to the last degree. The language shows «the most dextrous transformation of ordinary social gabble into mock heroic.» Many of the epigrams are characteristic of the age that «knew how to refine shrewd sense into wit»; and Pope's Ariel, though of course a mere parody of Shakespeare's, is a charming poetic fancy. As a whole ‹The Rape of the Lock› is the consummate satirical expression of a social phase and a masterpiece of its kind by a master artist in poetry.

Marion Tucker.

**RAPHAEL,** răf'ā-ĕl, **William,** Canadian artist: b. Berlin, Germany, 1839; d. Montreal, Canada, 16 March 1914. He studied painting at the Royal Academy, Berlin, under Wolf, Begas and others, and in 1860 settled in Montreal, where he afterward lived and worked. He painted both figures and landscapes, and in addition to his work as a painter conducted a large drawing and painting class. He was the first to introduce in Montreal drawing from casts and from life. Among his pupils was Wyatt Eaton. He was one of the original members of the Royal Canadian Academy of Art; and in 1904 he was appointed a member of the Council of Arts and Manufactures of the Province of Quebec. His works were largely acquired for private collections. Among them are ‹Bonsecours Market, Montreal, in Summer and Winter›; ‹Habitants attacked by Wolves›; ‹The Early Bird Gets the Early Worm,› etc.

**RAPHAEL SANTI,** rä'fä-ĕl sän'tē (called by the Italians Raffaelle and Raffaello, but generally in his own writings and in the signing of his pictures, Raphael), Italian painter: b. Urbino, in Umbria, 28 March 1483; d. Rome, 6 April 1520. The mountain town of Urbino was the capital of the ancient duchy of the same name, which came to an end in 1626. The castle or palace of the duke is still a building of extreme interest; and there is evidence that during the lifetime of Frederigo and Guidobaldo — who reigned during the years of Raphael's youth — the palace was one of the most remarkable museums in Italy, being crowded with works of art both of antique and of Renaissance production.

The young Raphael was allowed to devote himself to art the more readily that his father (Giovanni) was himself a painter. It seems that the family had lost property; and there is much in the record concerning Raphael to indicate the existence in his character of traditions of elegant life and that kind of sympathy which comes from ancestral cultivation. At a very early age for a student of art he entered the workshop of Perugino; his possibly earlier studies with Timoteo Viti being of little consequence to his artistic growth. It is asserted that the young man went to Siena, where Pinturicchio was at work; but this is doubtful, and it is only important because there has been so much question about the true influence which at first determined or modified Raphael's career. It was as early as 1504 that he first went to Florence, and the artists who would then have influenced him the most were Leonardo da Vinci and Michelangelo; because while the earlier Florentines would be more immediately recognized by him as painters of the ancient and traditional manner, it is clear from his subsequent history that he was more quick than any other man would have been to adapt himself to the larger conditions of a new world of art. The first absolutely modern painting may be said to have come into existence with Leonardo da Vinci, although that great master allowed himself but little time to devote to executive work, and has left us almost nothing by which we can judge his full strength. As for Michelangelo (eight years Raphael's senior, and as precocious), his work must have revealed to Raphael the possibilities of magnificent design in which the human body is treated as the principal subject, without important assistance in the way of draperies, backgrounds or even narrative subject, as a work of art.

The earliest painting which can be ascribed to Raphael with some certainty is the Marriage or Betrothal of the Virgin (called ‹Lo Sposalizio›) at the Brera Gallery in Milan. This picture shows the Umbrian feeling, and has many resemblances to the full manner of Perugino, Raphael's master; but it is significant that no serious attempt has been made to dispute the ascription of it to Raphael himself, so great is the resemblance in the peculiar grace of its composition to the more mature works of the younger man. The most important record we have of his earliest stay in Florence, ending with his 25th year, is the Madonna with Saints in the National Gallery, commonly known as the ‹Ansidei Madonna,› which, however, is thought to have been painted during a visit which he made to Perugia; and other Madonnas, such as that in the Pitti Palace, called the ‹Madonna del Gran' Duca,› and the ‹Madonna with the Goldfinch› in the Uffizi; as well as a picture in the Louvre Museum at Paris, called ‹La Belle Jardinière.› This epoch, however, was one of constant production, and there are many small paintings, only less important, than those named above, which may with considerable certainty be given to this period, namely, the years of his life from 20 to 25. It was in 1508 that he went to Rome.

It does not appear that Raphael was sent for directly by the order of Pope Julius II, but he began work there almost immediately on his arrival, and indeed the first of the famous halls in the Vatican which are covered with his paintings was completed, nearly as we see it now, as early as 1511. This room, known as the Camera della Segnatura, or Chamber of the Signature, is a hall roofed with a solid masonry vault, having one large window turned nearly to the north and lighting the room fairly well on bright days. On the west wall is the famous painting known as the ‹Disputa del Sacramento,› which should properly be called in English ‹The Glory or the Triumph of Religion›; and opposite this to the east is the ‹School of Athens.› Over the window is the Parnassus presided over by Apollo; and opposite the window is, in the lunette, the magnificent ‹Jurisprudence›; while below this and on either side of the deep niche serving as the recess of a window now condemned, are paintings having to do with the Papal authority in earthly and spiritual things. Similar paintings adorn the dado beneath the great pictures, and the vault itself is covered with work by Raphael's own hand; in fact, lovers of

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Raphael's painting, considered by itself and without reference to its historical importance, have always found the Camera della Segnatura the most delightful place for the study of the master's individuality. There is every reason to suppose that the greater part of the work here is due to his own touch; the employment of assistants being much less probable here than in later works.

When this first series of important wall paintings was completed Raphael was 28 years old and he had only nine years to live. During those nine years were produced the paintings in the four large rooms in the Vatican adjoining the Camera della Segnatura, and also the decorative frescoes in the Farnesina Palace, the outdoor corridors and vaulted galleries fronting the Cortile di S. Damaso in the Vatican, which are known as the Loggie di Raffaelle, and also a great number of easal pictures in oil, portraits, religious pictures sent as presents to the king of France and other foreign princes, and, toward the close of his life, two pictures of peculiar importance in his history, because they have always excited so much general admiration. These are the 'Madonna di San Sisto,' now in the royal collection at Dresden, and 'The Transfiguration,' left unfinished at his death, and now in the picture gallery of the Vatican. Raphael also made some designs, or at least undertook some superintendence as architect, especially in connection with the church of Saint Peter, and as designer of several palazzi, or stately mansions, in and near Rome. The excavations going on among the ruins of Rome also excited his interest and took up much of his time. He was surrounded by assistant artists who worked with him or for him, under his general direction and also from his studies and under his immediate control. It is now impossible to discriminate between these different ways of work, except by means of the internal evidence of more or less characteristic handling in the painting. Thus it is generally agreed that the large frescoes of the battle at the Milvian bridge and the other paintings in the Stanza di Constantino are almost wholly by the hand of his assistants; while those in the Stanza dell' Incendio and in the Stanza dell' Eliodoro are, though not wholly by the hand of Raphael, his work as to their general designs, as to their composition both in mass and in color and largely his own creation. The remarkable fact concerning these and the smaller paintings is that they all, except some of those in the Constantine series, belong to that well-known family or class of works which have become familiar to all the European world, as typical pictures by the artist who is generally accepted as the first of religious painters, while at the same time his name is used by artistic reformers as a symbol of the commencement of the decline of art.

His work shows little interest in realization of incident or of action; he is regardless of the impossibilities of the Apostles in long and voluminous robes, and of men in a fishing boat much too small for them — indifferent to the contradictions of the famous picture of 'The Conflagration in the Suburb' ('Incendio del Borgo'), where flames are seen flickering among marble columns and walls of cut stone without anything to feed them; and yet this lack of realism in his designs has never diminished his vast popularity, as the typical painter toward whose work everyone turns when there is mention of Christian religious painting. There is no better instance of the purely artistic quality obtaining full recognition in spite of the absence of those qualities which are generally considered more popular; the main reason for this is in the extraordinarily perfect composition in line and in mass, the figures filling the chosen oblong or the lunette or the circle in so many of his compositions, with absolutely faultless harmony, producing the desired result — a picture of entirely harmonious effect. As a colorist he is not one of those painters to whom glow and splendor of hue is the important thing, who deem design in color supreme, as do Correggio and the great Venetians from the time of Vivarini to that of Tiepolo; but invested his noble linear compositions with a coloring wholly agreeable, never violent, always satisfactory to the student of sentiment in art, and to the lover of noble composition — those students being more numerous in the world than the lovers of color for its own sake.

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Russell Sturgis.

**RAPHAEL WARE.** See Majolica and Mezza-Majolica.

**RAPHALL, Morris Jacob,** American rabbi and author: b. Stockholm, Sweden, September 1798; d. New York, 23 June 1868. In 1812 after receiving rabbinical education at Copenhagen, he went to England to study its language and literature, and after a continental tour spent three years at the University of Giessen, returning to England in 1825. In 1832 he lectured on post-Biblical history in London, in 1834 began a ‹Hebrew Review and Magazine of Rabbinical Literature,› which he edited with much scholarship, was associated with D. A. De Sola in a translation of 18 treatises of the ‹Mishna,› and with Messrs. De Sola and J. L. Lindenthal in a commentary on Genesis. In 1841 he was elected rabbi of the Birmingham Synagogue and in 1849 was called to the Congregation B'nai Jeshurun of New York, where he remained until his death. In 1855 he published his ‹Post-Biblical History of the Jews.› In addition he wrote some learned pamphlets and was a contributor to *The Jewish Messenger.* His defense of slavery from the biblical standpoint (‹The Bible View of Slavery›) aroused much controversy in the early days of the Civil War.

**RAPHANIA,** another name for the disease called ergotism (q.v.).

**RAPHIA,** a genus of low African palms with oval, gigantic pinnate leaves, and fruit spikes often weighing from 200 to 300 pounds.

**RAPID CITY,** S. Dak., city and county-seat of Pennington County, 125 miles southwest of Pierre, on the Chicago and Northwestern, the Chicago, Milwaukee and Saint Paul and the Rapid City, Black Hills and Western railroads. The city is located in the Black Hills mining region in which are deposits of gold, tin and mica. There are granite quarries and lumber interests, foundries, a chlorination plant, leather works and flour mills. The South Dakota School of Mines is located here and there is a United States government Indian school. Pop. (1920) 5,777.

**RAPID-FIRE GUNS.** See ORDNANCE.

**RAPIDAN RIVER,** a small river in Virginia, rising on the southeastern slope of Blue Ridge and flowing in an easterly direction toward the Rappahannock, which it enters 10 miles above Fredericksburg.

**RAPIDS.** See WATERFALL; CATARACTS.

**RAPIER,** a sword-like weapon of two different types: (1) a light, highly tempered two-edged and finely pointed weapon, about three feet in length; a favorite weapon used with the dagger for dueling and fencing during the 16th and 17th centuries; (2) the «small-sword,» a pointed weapon used during the 18th century without the dagger.

**RAPIN DE THOYRAS,** rä-păṅ dė toi-rä, **Paul,** French historian: b. Castres, Languedoc, 1661; d. Wesel, Duchy of Cleves, 1725. He studied at the Protestant Academy of Saumur, and was admitted an advocate in 1679. The revocation of the Edict of Nantes, however, drove him to England in 1686 and subsequently to Holland, where he entered a company of French cadets. In 1689 he followed the Prince of Orange and distinguished himself at the battle of the Boyne. In 1707 he settled at Wesel and devoted himself to historical composition. His great work, ‹L'Histoire d'Angleterre› (1724), was very animated, but impartial, and contains much solid information. The style is clear, the facts are methodically arranged, and he is always careful to cite his authorities. It embraces the period from the invasion of the Romans to the accession of William and Mary, but continuations by other pens were afterward added.

**RAPP,** räp **(Johann) George,** German sectary, founder of the communistic society called Harmonites: b. Iptingen, Würtemberg, 1 Nov. 1757; d. Economy, Pa., 7 Aug. 1847. He studied in the village school, became a linen weaver, and seems very early to have had religious doubts and visions, and dated his «complete surrender» from the year 1782. His peculiar religious ideas were so tinged with political socialism that his followers were persecuted by the German government; and in 1803 he emigrated. In the next year he founded at Harmony, near Pittsburgh, a communistic colony, where work, unity, equality and celibacy were the rule. A new colony, called New Harmony, was founded on the Wabash in Posey County, Ind., in 1815 and was sold to Robert Owen (q.v.) in 1824 when Rapp and his followers returned to Pennsylvania, founding on the Ohio River the town of Economy (q.v.). Consult Nordhoff, ‹Communistic Societies of the United States› (1875); Knortz, ‹Die Christlich-kommunistiche Kolonie der Rappisten› (1892).

**RAPP, Jean,** COUNT OF, French general: b. Colmar, Alsace, 27 April 1772; d. near Lorrach, Baden, 8 Nov. 1821. In 1788 he entered the military service, accompanied Desaix during the campaigns in Germany and Egypt, and after Desaix had fallen at Marengo became aide to Bonaparte. On the breaking out of the war against Austria, in 1805, he accompanied Napoleon, and after the battle of Austerlitz, where he threw the Russian guards into confusion by a bold attack with his cavalry, he was made brigadier-general. For distinguished service done in 1809 he was created a count of the empire, and in 1811 received the cross of grand officer of the Legion of Honor. He was seven years commander of Dantzic, which he defended after the retreat of the French army from Russia, till 1814, during a severe siege of nearly a year, in which he displayed great talent and brilliant courage, and not till all means of defense were exhausted and he was compelled by famine did he capitulate. Returning to France in 1814 he was received with distinction by Louis XVIII, and in March 1815 was sent against Napoleon. But when the defection of the whole army rendered all resistance impossible, Rapp also went over to Napoleon, who made him commander of the army of the Rhine. When Louis XVIII returned a second time to Paris, Rapp was pardoned, and retained the command of the 5th division, granted him by Napoleon, till the army was disbanded. After his death appeared the interesting ‹Mémoires du General Rapp, écrits par lui-même› (1823). Consult Spach, ‹Le Général Rapp› (1856).

**RAPPAHANNOCK,** răp-ạ-hăn'ȯk, a river of Virginia, formed by several small streams which have their rise in the Blue Ridge. It flows southeast into Chesapeake Bay, which it enters about 25 miles below the Potomac. It is about 250 miles long and is navigable over 90 miles from its mouth. The upper part of its course is through a mountainous country, where it is a swiftly flowing stream with many rapids and low falls. At Fredericksburg (q.v.) is a fall which furnishes extensive water power. From Fredericksburg the river becomes a tidal stream, and the broad, long estuary which enters the bay is navigable for the largest steamers. The name of the Rappahannock is associated with many of the events of the Civil War. See BOUNDARIES OF THE UNITED STATES.

**RAPPAHANNOCK STATION, Battle of.** In the fore part of October 1863 General Lee maneuvered the Army of the Potomac, under General Meade, from the Rappahannock River back to Centreville. Meade resumed the offensive 19 October, and in several encounters pressed Lee back to the Rappahannock, Lee crossing to the south side of the river and disposing his army on both sides of the Orange and Alexandria Railroad, Ewell's corps on the right and A. P. Hill's on the left, with cavalry on both flanks. A part of Ewell's corps was left on the north side of the river at Rappahannock Station, in an intrenched position covering the pontoon-bridge, the railroad bridge having been destroyed. The position was first held by General Hays' brigade and four guns, to which was subsequently added General Hoke's brigade, under Col. A. C. Goodwin. The whole force numbered about 2,000 men. Lee had destroyed the railroad from Bristoe Station to the Rappahannock, a distance of more than 20 miles, and this had to be rebuilt before Meade could follow to the river. It was completed as far as Warrenton Junction on 2 November; supplies were brought up; and on the morning of the 7th Meade advanced to cross the Rappahannock. General French, with the left wing of the army, moved upon Kelley's Ford, five miles below Rappahannock Station, and forced a passage of the river (see KELLY'S FORD, ENGAGEMENTS AT), while the Fifth and Sixth corps, under command of General Sedgwick, moved along the line of the railroad, forming line about midday within one and a half miles of Rappahannock Station, the right of the Fifth corps and the left of the Sixth on the railroad. Skirmishers were thrown forward and the Confederate position reconnoitered, and as soon as it could be ascertained a plan of attack was formed. The works to be carried consisted of two redoubts, connected by a chain of rifle-pits, and a further line of rifle-pits ran from the left redoubt to the river and some distance along it. The Fifth corps was to gain the river bank on the left and the Sixth on the right, in order to establish artillery on a range of high ground in front of the works and drive the men from them. The river bank was gained both on the right and left, artillery put in position and the works shelled, but at dusk no impression had been made, the Confederate guns had not been silenced, nor had the infantry been driven from the works. General Russell, temporarily commanding Wright's division of the Sixth corps, said that he could carry the works by assault, and he was ordered to do it. It was now after dusk; artillery fire was kept up; Russell led parts of Ellmaker's and Upton's brigades, in all 2,117 men, and, under a heavy fire of musketry and canister, went over the works in a very few minutes, capturing 1,303 officers and men, the four guns, 1,225 stands of arms and seven battle flags. A part of the Fifth corps on the left joined in the assault. General Wright says in his report that this was the first case during the war of an intrenched position being carried on the first assault, and one of General Lee's biographers writes that it was the saddest chapter in the history of the Army of Northern Virginia. General Hays, with nearly 300 of his men and about 130 of Hoke's, escaped. The Union loss was 413 killed and wounded and six missing. General Lee reports his loss as 6 killed, 39 wounded and 1,629 captured or missing, some of the missing being probably killed or wounded. Lee now abandoned his design of attacking General French, who had crossed at Kelly's Ford, burned the end of the pontoon-bridge remaining in his possession, the north end of it having been captured by Russell, and fell back during the night to Mountain Run. General Meade crossed the remainder of his army over the Rappahannock on the 8th and moved to Brandy Station, and Lee crossed to the south side of the Rapidan. Consult 'Official Records' (Vol. XXVI); Humphreys, 'From Gettysburg to the Rapidan'; the Century Company's 'Battles and Leaders of the Civil War' (Vol. IV).

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**RAPPISTS.** See HARMONISTS.

**RAPPROCHEMENT** (Fr., reconciliation), in diplomatic language, signifies a reapproachment or reconciliation between nations or governments after a period of enmity.

**RAPTORES,** an old name in classification, variously limited, for the predatory birds. See BIRDS OF PREY.

**RARATONGA,** rä-rä-tŏng'gä, or **RAROTONGA,** an island in the South Pacific Ocean, belonging to the group of Cook Islands (q.v.).

**RAREY, John S.,** American horse tamer: b. Franklin County, Ohio, 1828; d. Cleveland, Ohio, 4 Oct. 1866. In early life he showed a marked fondness for horses and skill in their management, which he later developed by study and close association with them. In 1856 he went to Texas to further his knowledge and upon his return to Ohio engaged in startling exhibitions of his skill; later he exhibited all over the United States. In training or taming the horse his methods were always prompted by a humane spirit, the use of the lash not being resorted to unless in extreme cases. In 1861 he visited England, Russia and other European countries, where his mastery over the wildest steeds amazed and delighted his vast audiences.

**RARITAN,** a river in New Jersey, the headwaters of which are in the northern part of the State. It enters Lower New York Bay at South Amboy, through Raritan Bay. The latter is really the broad mouth of the Raritan River. The river is navigable to Brunswick Landing, about two miles above New Brunswick.

**RASCAL LEAF-CRUMPLER,** the leaf-folding caterpillar of a phycitid moth (*Mineola indiginella*) injurious to many American fruit-trees, as the apple, cherry, plum (qq.v.), etc. See MOTH.

**RASH,** an eruption on the skin, characterized by reddening without large pustules. The commonest rashes are those of the specific fevers, the crimson rash of measles, the scarlet rash of scarlet fever, the rose-spots of typhoid fever, etc. But there are also numerous rashes due to disordered states of the body, and apart altogether from any infectious disease; such are nettle-rash and the like.

**RASHI,** rä'shē, properly **RABBI SALOMON-BEN-ISAAK,** sometimes erroneously called **JARCHI,** the most famous of French rabbins: b. Troyes, about 1040; d. 1105. Entering the Jewish school in Worms he made astonishing progress in ancient languages, philosophy, medicine and astronomy. His skill in explaining the Holy Scriptures and the Talmud was so remarkable that his contemporaries honored him with the titles of interpreter of the law and prince of interpreters. To satisfy his longings after knowledge he undertook an extensive tour through Italy, Greece, Palestine, Egypt, Persia and Germany, where he was particular in visiting the towns which possessed learned Jewish schools. The literary treasures thus collected he introduced into his writings, which were received at the time with the greatest enthusiasm, and are still held in high estimation. His Hebrew Bible commentary is still standard, also his famous commentary on the Pentateuch. He also wrote commentaries on the prophets; but his 23 treatises on the Talmud comprise the work that gave him his lasting fame. He wrote much in Old French, and his books are to-day the final authority as to the word forms then in use. Consult Zunz, 'Zeitschrift für die Wissenschaft des Judenthums' (1822); Graetz, 'History of the Jews' (Trans., Philadelphia 1891); Morris Liber (in 'The Jewish Ency.'. New York 1905).

**RASK,** räsk, **Rasmus Christian,** Danish scholar: b. Brendekilde, island of Funen, 22 Nov. 1787; d. Copenhagen, 14 Nov. 1832. He studied at the University of Copenhagen, undertook a journey to Sweden and Russia, to increase his acquaintance with the northern languages; and in 1808, after a two years' stay in Iceland became assistant in the academical library of Copenhagen. His fame as a linguist is founded upon such works as 'An Introduction to the Knowledge of the Icelandic or Old Norse Tongue' (1811); an edition of Biörnonis Haldorsen's 'Icelandic Dictionary' (1817); 'Instruction in the Anglo-Saxon Tongue'; 'Researches as to the Origin of the Old Norse or Icelandic,' and a series of grammars in nine languages. In 1822 he was appointed professor of literary history at the University of Copenhagen, and subsequently professor of Oriental languages and librarian to the university. During this period he published, among other works, 'Instruction in the Friesland Tongue'; 'On the Antiquity and Genuineness of the Zendavesta.' Consult 'Samlade Afhandlinger' (3 vols., Copenhagen 1834–38), these being his collected essays.

**RASKOLNIKS,** rạs-kôl'nyĭks, or **RASCOLNICIANS,** the name applied collectively to all the dissenters from the orthodox church of Russia, the Greek-Eastern Church. The schism, or *raskol,* was affected at two different times principally; first during the 17th century upon the occasion of the revision of the Testaments by Patriarch Nikou (1652–58) at Moscow; and upon the further revision and the usurpation of secular powers by Peter the Great (1689–1725). On both these occasions great bodies of Raskolniks, refusing to comply with the reforms instituted, left the Church and set up their own religious communities. The general characteristic of all the Raskolniks is conservatism. Their accessions have been due to the desire to cling to their old customs and beliefs.

The Raskolniks are of two great classes, each of which is subdivided with endless schisms and dissenting sects, more or less antagonistic to each other. The Popovtzi, those who have priests, *pops,* in Russian; and the Bezpopovtzi, or those who have no priests. Of these the Bezpopovtzi are the more numerous, the most aggressive and the least conservative.

The Popovtzi have not changed from the beliefs of their old Church. They are, for the most, inoffensive and tolerant, and have latterly been treated by the state with less severity than before. A certain measure of civic rights was also granted them, together with liberty of religious services.

The Bezpopovtzi were much more inimical to the State and the Church, as these were constituted prior to the Revolution of 1917. They believe that the present age is one of the anti-Christ, that the authorities to-day, both temporal and spiritual, are his servants and that, therefore, it would be sin to recognize their authority. Some of the principal sects of the Bezpopovtzi are: Duokhobors (q.v.), who in some respects resemble the early Quakers; the Vozdykhantzi, who hold that the world at present is under the reign of the Holy Ghost, whom they worship by prayers and sighing; the Philippines, who observe only two sacraments, the Lord's Supper and Baptism; the Stranniki, who believe the promises of the Lord concerning the Church are already fulfilled and that we are living in the first era of the resurrection; the Molokaneh and the Obschie (the latter being communists), who reject all external rites; and the anarchistic Khlisti and Skoptzi. The Khlisti are ascetics and practise many fanatical rites under the direction of their prophets and prophetesses, one being that of bodily scourge. The Skoptzi carry the beliefs of the Khlisti to an even greater extreme, mutilating their bodies in horrible manner in the frenzy of their rites. The Khlisti and Skoptzi were treated as criminals and transported to Siberia by the government under the old régime; other sects of the Bezpopovtzi were denied many of the civil rights enjoyed by the Popovtzi, were closely watched by the police and were much feared by the government.

The number of Raskolniks in Russia has been variously estimated as from 5,000,000 to 15,000,000.

**RASMUSSEN,** räs'mŭs'sĕn, **Knud Johan Victor,** Danish Arctic explorer: b. Jakobshavn, Greenland, 7 June 1879. He was educated at the University of Copenhagen, visited Lapland in 1901 and in 1902–04 he was a member of the Mylius-Ericksen expedition to Greenland. In 1905–08, 1909 and 1910 he was engaged in ethnological expeditions to Greenland, and in 1912–14 he headed an expedition for the recovery of the Mylius-Ericksen records, which, however, were found by Mikkelsen. His trip resulted in the discovery of a considerable area of ice-free land and proved the non-existence of the Peary Channel. Rasmussen has made extensive reports of his explorations and ethnological researches. Author of ‹Lapland› (1907); ‹The People of the Polar North› (1908); ‹Avangarnisalerssârutit› (1909); Rasmussen sermerssuákut Tunuliarnilerssârutit› (1916), etc.

**RASORES**, rạ-sō′rēz, group of birds and «scratchers,» so named from their habit of scratching the ground for food, represented by such forms as the fowls, partridges, grouse, pigeons, etc., which were long ago assigned to various natural orders and families. Illiger grouped them in two sub-orders, the *Columbacei* and the *Gallinacei*. Later they were made orders of Carinate birds; the former (Columbæ) including the pigeons, and the latter (Gallinæ) with eight families: Cracidæ, Opistleocomidæ, Phasianidæ, Meleagridæ, Tetraonidæ, Pterodidæ, Turuicidæ and Megapodidæ. The Rasores of Vigors consist of the families Columbidæ, Phasianidæ, Tetraonidæ, Struthionidæ and Cracidæ; those of Swainson, of Pavonidæ, Tetraonidæ, Struthionidæ, Columbidæ and Megapodidæ; and those of Gray, of Cracidæ, Phasianidæ, Tetraonidæ, Chionidæ and Tivamidæ.

**RASPAIL**, rạs′pā′y′, **François Vincent**, French politician and scientist: b. Carpentras, 29 Jan. 1794; d. Arcueil, 7 Jan. 1878. He went in 1816 to Paris. He took part in the July Revolution of 1830, and later established a journal, *Le Réformateur,* which in 1834 was suppressed by the government, while in 1835 its editor was condemned to a six months' imprisonment. On 24 Feb. 1848, at the head of a mob, he penetrated to the council chamber of the provisional government, which he compelled forthwith to proclaim the republic. He then founded *L'Ami du Peuple,* later called *Démocratie Pacifique,* in which he proclaimed Jacobin principles. On 15 May he was a leader of the invaders of the Palais Bourbon and the hall of the National Assembly; for this he was condemned to six years in prison, but in 1855 the sentence was commuted to banishment. He lived in Brussels, but returned to France under the amnesty of 1859, was elected to the Corps Législatif in 1869, retired to private life during the Commune, and from 1876 was a member of the Chamber of Deputies. From 1824 till 1830 he contributed many scientific articles, especially on chemistry, to the ‹Annals of the Natural Sciences› and other works, and by many has been considered the creator of the system of organic chemistry. Among his works were ‹Annales des Sciences d'Observation› (1829–30); ‹Recherches Chimiques et Physiques sur le Développement des Tissus Végétaux› (1827); ‹Cours Elementaire d'Agriculture et d'Économie Rurale› (1831); ‹Système Nouveau de Physiologie Végetale et de Botanique› (1836); ‹Système de Chimie Organique› (1837); ‹Histoire Naturelle des Ammonites› (1842); ‹Nouvelles Etudes Scientifiques et Philologiques› (1865); ‹Réformes Sociales› (1872). Consult Marchal, ‹Biographie de F. V. Raspail› (1848); Querard, ‹La France Littéraire›; ‹Nouvelle Biographie Générale.›

**RASPBERRY**, a general name for those shrubs of the genus *Rubus,* whose fruits separate from the receptacle upon attaining maturity. They are natives of the north temperate zone and are especially numerous in Europe and America. They are characterized by their perennial underground parts, usually biennial spiny stems which with few exceptions bear fruit the second season and then die. A few cultivated varieties, notably Saint Regis and Gault, bear some fruit on the young stems the same season as these develop. Several species are valued for ornamental purposes but the three following are the most important because of their edible fruits, for which the plants, except the first which is unsuited to American climatic conditions, are widely cultivated, especially in the United States and Canada. The European raspberry (*R. idæus*), which has been cultivated in Europe for several centuries, was among the earliest European fruits introduced into America, but it has not made an equal headway with the next species because it has a very extended period of ripening, and is more adapted to the amateur than to the commercial berry-grower. Its fruits, either red or yellow, are of the best quality, but the plants are considered somewhat tender in northern climates. The American red raspberry (*R. strigosus*) resembles the preceding species in habit and color of fruit, but is rather inferior in quality. This defect, however, is offset by its hardiness, ready adaptability to many conditions and its prolific and rapid production of fruit. The black raspberry or blackcap (*R. occidentalis*) is the most important species of its genus, since it is hardy, productive, adaptable to many soils and conditions, and its fruits, being firm, are useful for shipping considerable distances or for evaporating as well as for canning and eating fresh. It was introduced into cultivation in 1832, since when several hundred varieties have been offered for sale.

The red raspberries are propagated by means of suckers, or root-cuttings. The former may appear at any time throughout the growing season; the latter may be made by thrusting a spade deeply into the ground around well-established plants and thus severing the roots, each piece of which will produce a new plant. With new or scarce varieties the plants are often dug up, the roots cut in small pieces and rooted in greenhouses, hot beds and cold frames. In the field the plants are usually set not less than 3 by 5 feet apart, the plants being allowed to form a continuous hedge row, cultivation being given only one way. Except while the plantations are under three years old it is impossible with most varieties to cultivate in two directions (checks) because the plants develop suckers abundantly.

The black raspberry does not produce suckers, except at the crown, but the tips of the canes bend over until they reach the ground and become covered and develop roots. Other buds near the end may develop short stems which also become rooted. These «tips» are severed for planting, sometimes in autumn but usually in spring, and are set somewhat farther apart than the red varieties, usually 5 by 5 or 6 by 6 feet part. They are generally cultivated in two directions because of this «killing» habit. There is a hybrid group of raspberries which propagate by both tips and suckers or root cuttings, usually by the latter. They are supposed to be derived from the black and the

American red species, but since they are common in the wild state and are fairly stable, they are often grouped under the species name, *R. neglectus*. Several varieties have been widely cultivated. Their fruit ranges from purple, through reds to yellow.

Raspberries succeed best upon deep, moist, but well-drained loamy soils; the blacks upon the heavier and the reds upon the lighter. The more retentive of moisture the soil is the better, since the fruit ripens at a time when water is often scarce. Hence the addition of humus is usually desirable. It may be most easily obtained in the form of stable manure and green manures, such as clover grown at least one year before planting to raspberries. The ground should be plowed as deeply as possible without turning up the subsoil, and after harrowing, the plants set. Clean cultivation both ways is usually practised until midsummer when a cover crop of crimson clover or some shallower rooting plant is sown to be turned under the following spring. Sometimes, however, other crops, such as peas, beans, tomatoes and other shallow rooting vegetables which are not tall, are grown between the rows for one or perhaps two years. Wood ashes, muriate of potash, superphosphates and ground bone are favorite sources of potash and phosphoric acid. With adequate tillage during the summer, spring plowing may be avoided.

The pruning of the red varieties consists in pinching back the shoots during the first season, allowing only about five canes to grow in each stool in after years, avoiding the pinching of shoots unless the soil is very strong and the growth rampant, and cutting out the old canes as soon as they have fruited. The pruning of the blackcaps consists in pinching off the tips each year as soon as they have reached a height of about 20 inches. This tends to make the canes stocky and self-supporting. Spring pruning consists in shortening in the branches to about 18 inches and removing pruny and excess shoots. This latter amounts to thinning and should be carefully done.

For market the fruit should never be picked until after the dew has dried and should be shipped to market in small packages. Red raspberries are usually marketed in pint baskets. Black raspberries, especially for canning, are often gathered by jarring the ripe fruits into aprons with boxes attached, the fruit being passed through a fanning mill to blow away the leaves, etc. Generally, however, the picking is done by hand with red raspberries and with both kinds for the best markets.

Among the numerous insects which feed upon the raspberry are two species of cane-boring beetles, *Agrilus ruficollis* and *Oberea bimaculata*; wilting of the canes is usually the first indication of their presence, cutting and burning the injured ones is the only remedy recommended. The striped tree-cricket (*Œcanthus nigricornis*) often lays its eggs in the stems, but is considered to be a beneficial insect otherwise, since its food consists largely of plant-lice. Several caterpillars and other foliage-chewing insects, such as the raspberry saw-fly (*Monophadnus rubi*), occasionally prove troublesome, and some of the stink-bugs reveal their presence by their disagreeable flavor when inadvertently eaten. General remedies have been recommended for these insects. (See Insecticide). Several so-called plant diseases have been reported upon the raspberry. The orange rust has never been successfully combated. It attacks weak plants. Digging out and burning the plants attacked by it is the only remedy. It should be done as soon as the disease is discovered in May. Anthracnose has been held in check by spraying with Bordeaux mixture. See Fungicide.

Consult Bailey, ‹Standard Cyclopedia Horticulture› (New York 1914–17); Card, ‹Bush-Fruits› (New York, 2d ed., 1917); books on insects listed under Insecticide, and numerous bulletins of Agricultural Experiment Stations and of the United States Department of Agriculture.

**RASPE**, ras'pe, **Rudolph Eric,** German mineralogist and author: b. Hanover, 1737; d. Muckross, Donegal, Ireland, 1794. In 1767 he was made professor in the Collegium Carolinum of Cassel, and curator of the Landgrave's museum of coins and antiquities. He published at this time papers on mineralogy and geology. In 1775 he went to England, where he was variously employed, generally as a mining expert. He published in 1785 ‹Baron Münchhausen's Narrative of his Marvelous Travels and Campaigns in Russia,› founded in part on the hunting stories of one Baron von Münchhausen, of Hanover. His work appears as chapters ii–vi of the later Münchhausen (q.v.). Among his other writings, apart from his works on mineralogy, may be noted ‹A Descriptive Catalogue of a General Collection of Engraved Stones› (1791) and several philosophical stories. See Adventures of Baron Münchhausen.

**RASPUTIN**, rą'spoo-tēn', from the Russian word rasputny, dissolute, profligate, libertine, licentious: an opprobrious nickname conferred upon a notorious Russian monk named Gregor Novikh (q.v.).

**RASSAM**, räs-säm', **Hormuzd,** Turkish archæologist: b. Mosul, Asiatic Turkey, 1826; d. Brighton, England, 16 Sept. 1910. Having formed the acquaintance of Layard (q.v.) in 1845 when the latter was beginning his explorations of Nineveh, Rassam accompanied him on his return to London and entered Oxford University, after which he went with Layard on several archæological expeditions. In 1851 Rassam, upon commission from the British Museum, collected for that institution a number of specimens of Assyrian art, particularly a series of sculptures representing the lion chase. In 1864 the British government dispatched him on a mission to Abyssinia to secure from King Theodore the release of their consul, Mr. Cameron, and others held prisoners; but he was himself taken prisoner and held until the defeat of Theodore's army by Sir R. Napier in 1868. After 1876 he resumed his collections for the British Museum, the most notable of which were the bronze gates of Balawat, dating from Shalmanezer II, 858–824 B.C., and the «Abu-Habba tablet,» from the temple of the sun-god in Sippar, recording the restoration of the temple by Nabu-apal-iddin. The British Museum was also enriched by his discovery of 5,000 tablets representing, probably, the library of an ancient Babylonish king. Rassam published a ‹Narrative of the British Mission to Theodore› (1869); ‹Asshur and the Land of Nimrod›

(1897); 'The Garden of Eden and Biblical Sages,' and 'Biblical Lands.'

**RASSE**, răs, a small arboreal civet (*Viverricula malaccensis*), which is widely distributed in southeastern Asia and the Malayan islands, and long ago became naturalized in Madagascar. It is slender, agile in tree-climbing, has no erectile mane and lives in holes in rocky and brushy districts. In confinement it is easily tamed and feeds on small animals, which it catches with cat-like dexterity. Hence it is often kept in houses in the East as a ratter, and also for the sake of its civet, which is artificially removed from the glands. It is a handsome little animal of a yellowish or brownish gray color, with longitudinal bands on the back and regular spots on the side; tail 16–17 inches long with eight or nine complete dark rings; length of body and head about 24 inches; known, zoologically, as the lesser-civet. Consult Blanford, Jerdon, Tennent and other authorities on Oriental zoology.

**RASSELAS**, the name usually given to a moral story with an Oriental setting written by the famous lexicographer and essayist, Dr. Samuel Johnson, and published in the spring of 1759, in two volumes, under the title of 'The Prince of Abyssinia: A Tale.' It reached a second edition the same year, and has since been often reprinted and translated, maintaining its rank as a notable if somewhat old-fashioned English classic. There is uncertainty as to just when and why and in how short a space of time it was written, but it seems clear that Johnson composed it rapidly at the period of his mother's death in January 1759, and that he probably used some of the money it brought him for filial purposes connected with that event.

Scholars have exercised themselves over the sources and the materials of the story, and have shown that Johnson did not invent his happy valley, his Abyssinian paradise; but they have taken away none of the credit due him for selecting an impressive theme — the vain search of youth after happiness — and for treating it with adequate weight of thought, soundness of feeling and dignity of style. The book plainly belongs with the grave, solid, somewhat magniloquent essays of his middle period rather than with the less stilted biographies of his old age, and it holds by his early years in owing something to his translation of theFrench version of Lobo's 'Voyage to Abyssinia.' Everyone of its 49 short chapters, however little calculated to arouse the interest of the experienced reader of modern novels, is thoroughly representative of Johnson himself — of his sturdy morality, his common sense, his wide knowledge of men and books, his sombre but far from cowardly and depressing views of life.

The plot is simple in the extreme. Rasselas, shut up in a beautiful valley, «till the order of succession should call him to the throne,» grows weary of the factitious entertainments of the place, and after much brooding escapes with his sister Nekayah, her attendant Pekuah and his poet-friend Imlac. They are to see the world and search for happiness, but after some sojourn in Egypt, where they frequent various classes of society and undergo a few mild adventures, they perceive the futility of their search and abruptly return to Abyssinia. That the plot should be so simple, that local color should be almost nonexistent, that episodic elements, e.g., the story of Imlac and that of the mad astronomer, should abound, is not surprising when one considers what didactic purposes the Oriental tale of 18th century western Europe was intended to serve and remembers that Johnson was a moralist and essayist, not a novelist. What does surprise is that with so little of incident, with no love-making, with few endeavors to charm the fancy, with but slight recognition of the claims of sentiment, 'Rasselas' is none the less a story that deserves its fame. It does this, not so much because it is, like 'Candide,' but in a very different way, an effective protest against shallow optimism, whether of deist or of «hustler,» but because it contains not a little of the courageous philosophy of life which a great, unique personality had formed for himself at the height of a literary career full of moving vicissitudes. Consult the editions of G. Birkbeck Hill and of O. F. Emerson.

William P. Trent.

**RASTATT**, räs'tät, or **RASTADT**, a town of Baden, Germany, on the river Murg, about four miles from the Rhine and about 15 miles southwest of Karlsruhe. It was formerly a fortress of the first rank but in 1892 the fortifications were dismantled. The town has manufactures of lace, tobacco and cigars. Pop. about 15,196. Rastatt was the scene of two diplomatic congresses in the 18th century. The first congress of Rastatt met in 1713 to arrange terms of peace between the emperor and France, then still engaged in the war of the Spanish Succession. Peace was concluded 7 March 1714. In accordance with the terms of the treaty, signed by Marshal Villars and Prince Eugene, France gave up possession of the towns of Kehl, Freiberg and Breisach, and the electors of Cologne and Bavaria were reinstated in power. The terms of the Treaty of Utrecht (q.v.) were ratified. The second congress of Rastatt met in 1797 for the purpose of terminating hostilities between France and the empire. After negotiations had been prolonged for more than a year, war broke out again between France and the allies and the congress suspended its sessions (April 1799). As the French representatives, Roberjot, Bonnier and Debry left the city on the evening of 28 April they were set upon by a company of hussars wearing the Austrian uniform and the first two were murdered and the third sabred and left for dead in a ditch. The papers of the legation were carried off, but no other spoil was taken. This violation of the law of nations aroused the indignation and horror of all Europe. Many attempts have been made to fix the responsibility for the deed. Some have ascribed the crime to the Austrian government which was desirous of obtaining certain papers in the possession of the ambassadors; others maintain that the murderers were French émigrés, while others still assert that the act was instigated by Napoleon and other leaders of the War party in France for the purpose of exasperating the French people against Austria. In 1849 the town again became conspicuous as the stronghold of the Baden revolutionists.

**RAT,** any of several large rodents of the mouse family (see Mouse), especially two species of «house-rats» now habituated to civilization in all parts of the world. The black rat (*Musrattus*) is of light and slender build, about seven inches in length, usually of a bluish black color, but sometimes grayish, and has quite large, thin ears. The brown rat (*M. decumanus*) or Norway rat, as it is often inappropriately styled, is much heavier and larger, with short, rounded cars and a dull brown color. Both species are believed to be natives of China but the black rat was abundant in Europe at least as early as the 13th century. The brown rat migrated from western China, entering Russia in great numbers in 1727, and from there quickly spreading over Europe, which was fully occupied by it by the middle of the 18th century. By its greater fecundity and ferocity it quickly overcame the black rat, which it has now replaced in most parts. It infested ships and by this means has been carried to all parts of the world. Its wonderful capacity for increase (from 20 to 50 annually), its boldness, tough, elastic constitution and adaptable nature, make it everywhere dominant, and its omnivorous habits, voracity and destructiveness frequently lead it to become a source of great annoyance, loss and disease about human habitations. The ferocity of this species when brought to bay is well known; and when driven by hunger it is so ravenous that neglected babies have been known to be killed and eaten by them, and a few cases are recorded where even able-bodied men have suffered a like fate when attacked by hordes of rats. They are also agents in the spread of disease, particularly bubonic plague and trichinoses. Against their many faults may be set the solitary virtue that they serve a useful purpose as scavengers in the city sewers, etc. The albino and black and white pied rats sold for pets by bird dealers are derived from the black rat, which has a far milder disposition. The rats of the United States include the black and brown of Norway, above described; the roof, or white-bellied (*M. tectorum*) of the Southern States, named from its preference for thatched roofs for its abode; the Florida (*neotorua Floridana*) a habitat of the Gulf States, common to wild places and swamps, and frequently nesting in trees; the Cotton (*Sigmodon hispidus*), named from its use of cotton in forming its nest; and the Rocky Mountain, which is destructive to the trappings and stores of campers. Rat skins make fine leather for gloves.

**RAT-KANGAROO.** See Kangaroo.

**RAT PORTAGE.** See Kenora.

**RAT-TAIL,** one of the pelagic, cod-like fishes of the genus *Macrourus,* specifically *Macrourus bairdi* of the coast-waters of the eastern United States. The body terminates in a long, compressed, tapering tail, covered with spiny, keeled or straited scales. About 40 species are known.

**RATA,** any of several New Zealand trees of an Australian group of the myrtle family which includes the local ironwoods. Foremost among them is *Metrosideros robusta,* a tall strong tree, of very hard wood, used by the natives for making their war-clubs and by the colonists in cabinet-work and in shipbuilding. Another species (*M. florida*) is a huge climber. These trees have very showy flowers, usually red, and characterized by many long erect stamens; and several species of the genus are cultivated as ornamental shrubs, and have been acclimatized in other parts of the world. One (*M. tomentosa*) is known in New Zealand as «fire-tree.»

**RATAFIA,** răt-ạ-fē'ạ, generic name of a series of cordials, prepared usually by mixing an alcoholic liquor with the juice of some fruit or some flavoring material and sugar or syrup. The name is of French origin, and is said to have been given in consequence of the former habit of preparing a choice drink to be used at the ceremony of ratifying a treaty. A favorite flavoring is the almond — hence, bitter almonds, as well as cherry, peach, apricot, plum and other similar kernels, are much used; but many other flavors are also used, as orange flowers, gooseberries, raspberries, aniseed, chocolate, black currants, etc.

**RATANY,** or **RHATANY.** See Rattany.

**RATCHFORD, Michael D.,** American labor leader: b. Clare, Ireland, August 1860. He came to the United States with his parents in 1872, settling in Stark County, Ohio, and entered the coal mines soon afterward, studying in the evening schools. He became an active trade unionist in 1880, was elected president of the Massillon, Ohio, miners in 1890 and continued active in labor organization, serving as president of the United Mine Workers of America in 1897–98. During his presidency of that organization he succeeded in gaining the eight-hour day in bituminous coal fields and secured an annual wage contract between mine workers and operators. He was a member of the National Industrial Commission in 1898–1900; served as commissioner of labor statistics of Ohio in 1900–08; was commissioner of the Ohio Coal Operators in 1909–12, and since 1913 has been commissioner of the Illinois Coal Operators' Association.

**RATEL,** a South African badger (*Mellivora capensis*), rather larger than the common European or American badger, which lives in burrows in open districts. It differs from the Indian honey-badger (q.v.) mainly in the presence of a distinct white line along its sides, from the nose to the hocks, separating the black underparts from the blanket-like gray of the back. It is easily tamed, and is amusingly active in confinement, continually running about its cage and turning odd somersaults to attract attention of spectators, from which it seems to derive great pleasure.

**RATHBONE SISTERS, Order of.** See Orders, Religious.

**RATHBUN, Richard,** American naturalist: b. Buffalo, N. Y., 25 Jan. 1852; d. 16 July 1918. He was educated at Cornell and at the University of Indiana. He was assistant geologist of the Geological Commission of Brazil in 1875–78, and assistant in geology at Yale in 1879–80. After 1880 he was curator of the United States National Museum. He was scientific assistant on the United States Fish Commission in 1878–96, being in charge of the scientific inquiry after 1887; and in 1892–96 he was United States representative on a joint commission with Great Britain for the purpose of preserving the fisheries in the waters contiguous to the United States and Canada. He was assistant secretary of the Smithsonian Institution after 1897 and in charge of the United States National Museum after 1899. He contributed extensively to government and other publications.

**RATICHIUS,** rā-tĭk'ĭ-ŭs. See RATKE, WOLFGANG.

**RATIFICATION,** *in law,* the confirmation, sanction or approval given by a person who has arrived at his majority to acts done by him during his minority. It has the effect of giving validity to such acts as would be otherwise voidable. «An act performed by one for another, is adopted as his own act when by him ratified. Ratifications are either expressed or implied. The former are made in express and direct terms of assent; the latter are such as the law permits for the acts of the principals.» *In Scotch law* the acknowledgment by a married woman, apart from her husband and before a justice of the peace, that a deed executed by her is voluntary, and with full knowledge of its legal effect. In this sense the term corresponds to what is technically called in England and the United States an «acknowledgment» by a married woman. In American political life the term is applied to a popular endorsement of an act by party leaders, as a nomination for public office. The term is also synonymous with «confirmation,» as when a verbal, telegraph or telephone agreement is confirmed by a signed evidence from the parties in interest.

**RATIO** (from the Latin *ratio,* meaning reckoning, calculation), *in mathematics,* the measure of the relation which one quantity bears to another of the same kind; that is, the number of times that one quantity contains another regarded as a standard. This is found by dividing the one by the other. The quotient or ratio thus obtained is the proper measure of the relation of the two quantities. Some mathematicians define the ratio of one quantity to another as the quotient of the first quantity divided by the second, and others define it as the quotient of the second quantity divided by the first. The operation of finding a ratio is purely numerical, and the resulting ratio is consequently an abstract number. Ratios are known as *prime* or *ultimate,* according as the ratio of the variable quantities is receding from or approaching to the ratio of the constant quantities. Proportion is the relation of equality subsisting between two ratios. See MATHEMATICS; PROPORTION.

**RATION,** in the army and navy, is the allowance of provisions given to each officer, noncommissioned officer, soldier and sailor. In the American army the ordinary ration is commonly supplemented by additional articles bought with what is known as «the company fund,» money derived from certain allowances made to the soldiers. The American troops and sailors are as well fed as any in the world, whether in camp or war. The rations have varied with the time and place. A standard United States garrison ration includes 20 ounces beef, 18 flour, 2.4 beans, 20 potatoes, 2.8 prunes, 1.12 coffee, 2 sugar, 0.5 canned milk, 0.5 butter, 0.6 lard and minute portions of salt, pepper and vinegar. For a field ration bacon usually takes the place of beef, and the bread may be reduced with an increase of canned beans, tomatoes, etc. A forage ration for a horse is 12 pounds oats, 14 of hay; the mule being lighter is fed 9 pounds of oats, but the same quantity of hay. During the World War bakeries were maintained in the army to supply fresh field bread whenever possible. The cost of the United States army rations has advanced steadily, being 13.18 cents in 1890. 14.42 in 1895, 16.97 in 1900, 16.18 in 1905, 21.44 in 1910, 25.32 in 1915, 26.81 in 1916 and 32 in 1917. British army rations are nearly identical with the American; the German is less expensive, they introducing considerable rice, zwiebach, etc.

**RATIONALISM,** in its more general signification, denotes a tendency or attitude of thought, either on the part of an individual or an age, to demand that prevailing beliefs, customs and institutions shall be subjected to critical examination, and be required to justify themselves before the court of reason. In its more specific sense, the term refers to the doctrines of a particular school of philosophical thinkers, which flourished mainly in France and Germany during the 17th and 18th centuries and which regarded reason as the only source of certain knowledge and the only test of truth.

In the general and more popular use of the term, rationalism is equivalent to a demand for a reasonable explanation in scientific terms. The rise of rationalism is thus in many respects identical with the development of the scientific spirit of inquiry. As such, it is opposed to mysticism and supernaturalism. Lecky, in his 'History of the Rise and Influence of Rationalism in Europe,' explains the word as follows: «By the spirit of rationalism, I understand not any class of definite doctrines or criticisms, but rather a certain cast of thought, or bias of reasoning, which has during the last three centuries gained a marked ascendency in Europe. . . . At present, it will be sufficient to say, that it leads men on all occasions to subordinate dogmatic theology to the dictates of reason and of conscience, and, as a necessary consequence, greatly to restrict its influence upon life. It predisposes men, in history, to attribute all kinds of phenomena to natural rather than miraculous causes; in theology, to esteem succeeding systems the expressions of the wants and aspirations of that religious sentiment which is planted in all men; and, in ethics, to regard as duties only those which conscience reveals to be such.» Between the claims of revealed religion and the spirit of rationalism the conflict has been especially sharp and long-continued. This opposition shows itself even before the birth of Christianity in almost all of the older religions. In Greece, for example, where religion was only to a very slight extent embodied in dogmas, the philosophers were nevertheless frequently charged with atheism, or with perverting and destroying the national religion through their rationalistic teachings. With the establishment of the Christian Church, the doctrines of religion were explicitly declared to be above reason and to rest upon a higher authority than human reason could afford. Nevertheless, from time to time there arose thinkers within the Church itself who strove to reduce the theological doctrines to a rationalistic basis, interpreting them in such a way as to minimize or destroy the supernaturalistic elements which they contained. Of these mediæval rationalists Abelard (q.v.), 1079–1142, is perhaps the most famous. It was not until the 18th century, however, that rationalism became strong enough and bold enough to make open war upon the prevailing theological beliefs and doctrines. This century was called the age of enlightenment, and in it the demand arose on all sides that everything should be explained in terms of the clear and distinct ideas of reason, that mysteries and superstitions should be abolished, that the authority of Church and State should be limited and subordinated to the principles of reason and the interest of the individual members of society. The Deistic movement in England is especially noteworthy as maintaining the right of individual free thought in matters of religion, and as attacking the abuses and absurdities in the existing theological creeds. Lord Herbart of Cherbury and John Locke may be regarded as forerunners of English Deism (q.v.). The best-known representatives of the movement are John Toland (1670–1729), Anthony Collins (1676–1729), Matthew Tindal (1657–1733), Thomas Chubb (1679–1747) and Thomas Morgan. The influence of this movement was felt throughout Europe. In Voltaire it found a spokesman of extraordinary literary power who had also the courage to carry its principles to its logical conclusions.

The spirit of rationalism, in so far as it represents the claims of free scientific inquiry, may be said to have already won its triumph. This triumph too, it must be admitted, was largely the result of the enthusiastic zeal of the apostles of the enlightenment. Nevertheless, the spirit of modern inquiry has been profoundly modified in many respects during the 19th century. In the first place, it has lost the narrowness and hardness that it necessarily exhibited so long as a large share of its strength was expended in negative criticism and in making war upon prevailing creeds and institutions. In addition, it has been transformed by the historical and evolutionary conceptions that have become dominant in every field of inquiry, leading men's thoughts to problems of genesis and origin, and so to understand and sympathize with much that appeared absurd and unmeaning to the older rationalists. The 18th century rationalists regarded the world as static; they looked at each thing as it actually stood before them in their own day, and judged it by the unfailing standard that each individual was supposed to possess in the clear and distinct ideas of his own individual reason. The historical point of view has brought with it a broader conception of reason and what is rational; it has taught us that it is only in the light of its origin and function that a thing can properly be judged, and that, accordingly, there may be a truer rationality in historical creeds, beliefs and institutions than in the self-confidence of the individual of clear and distinct ideas who ventures to criticize what he does not understand.

The philosophical doctrine known as Rationalism owes its origin to Descartes (1596–1650), and has its home mainly in France and Germany, while empiricism (q.v.), the theory to which it was directly opposed, flourished mainly in England. The rationalistic philosophers take mathematical demonstration as the perfect type of knowledge and seek to model their procedure in all fields of inquiry on what they assumed to be its method. From the chaotic and contradictory material supplied by sense-perception they believed that real knowledge, science, could not be attained. Mathematics, however, reaches its results in independence of such a source. It begins with fundamental principles and conceptions which are self-evident and proceeds by means of logical analysis and reasoning to show what further results are necessarily involved and implied in the starting-point. Now, the rationalistic thinkers maintain that what has been achieved in this particular science may be carried out universally by the application of the same method. That is, the true method of knowledge consists in first discovering by analysis the fundamental truths that lie at the basis of all thinking. These truths are not derived from experience, but, like the mathematical axioms and first principles, are native to the mind, innate ideas or a priori truths that are the starting-points for all demonstration and all science. When these are once discovered, it is the further task of philosophy to deduce by logical reasoning the further results that follow from them. In this way the rationalists supposed that it was possible to arrive at conclusions in philosophy that are as demonstrably certain as the propositions of geometry.

Besides Descartes, the chief representatives of rationalism are Spinoza (1632–77), who adopted the geometrical form of proof in his chief work, the 'Ethics'; Leibnitz (1646–1715), and Christian Wolff (1679–1754). The last-mentioned philosopher, though the least original, exercised a great influence over the thought of Germany by his terminology and by the systematic way in which he divided the field of philosophy into the so-called sciences of rational cosmology or physics, rational psychology, and rational theology. The first of these seeks to furnish demonstrative proof of the fundamental nature of the physical universe; for example, that it is limited in space, had a beginning in time, is made up of indivisible parts, etc. Rational psychology sets out from the conception of the soul as a spiritual substance and attempts to prove that it necessarily follows as a result of this initial conception, that the soul is simple, indivisible, indestructible and, therefore, immortal, and, moreover, that it possesses certain faculties, such as those of representation, desire, as essential to its true nature. In like manner, rational theology dealt in the same a priori and deductive way with the various proofs for the existence and attributes of God. This was the form of rationalism in which Kant was educated and it is against these so-called rationalistic sciences that he directs his attack in the dialectic of the 'Critique of Pure Reason.' The criticism of Kant was so penetrating and thoroughgoing that it annihilated at a blow the claims of rationalism. It did this by pointing out, in terms that could neither be mistaken nor denied, the falsity of the assumptions upon which this philosophical theory rests. Kant is thus the destroyer and finisher of rationalism.

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Rise and Influence of Rationalism in Europe›; Stephens, ‹History of English Thought in the Eighteenth Century›; White, ‹The Warfare of Science and Religion›; Paine, ‹Age of Reason›; Cairns, ‹Unbelief in the Eighteenth Century› (1881); Descartes, ‹Discourse on Method›; ‹Meditations on the First Philosophy›; Zeller, ‹Geschichte der deutschen Philosophie seit Leibnitz›; Windelband, ‹History of Philosophy› (translated by J. H. Tufts); Fischer, Kuno, ‹Geschichte der neueren Philosophie› (Vol. III); Kant, ‹Critique of Pure Reason.›

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**RATIONALISTS.** See Religious Sects.

**RATISBON,** răt'is-bŏn **(REGENSBURG,** rā'gĕns-boorg), Bavaria, Germany, 82 miles by rail northeast of Munich, partakes of the artistic tendencies of the latter. Chief among its public buildings and institutions are the Gothic cathedral, library, art-gallery, seminaries and glass-staining factory. Trade, facilitated by its favorable position on the Danube, is considerable. Ratisbon suffered much from bombardments at various periods of its history, especially in 1809, when it was stormed by the French. It became a free port in 1853. Pop. (1910) 52,624.

**RATITÆ,** rā-tī'tē, a group of birds broadly characterized as having a non-carinate sternum and little or no power of flight. The group originally was one of the two grand divisions of *Aves,* embracing all those whose sternum had no keel, as opposed to *Carinatæ;* but this character alone will not define the *Ratitæ* as at present constituted by the researches of Gadow and accepted by ornithologists generally. Its place is as a subdivision of the *Neornithes* (q.v.) co-ordinate with the *Odontolcæ* (*hesperornis,* etc.) and the *Carinatæ;* and the sum of many anatomical peculiarities distinguishes the group, which consists of the ostriches, cassowaries, kiwis, moas, rocs (*Æpyornis*), and perhaps some of the fossil birds of Patagonia whose relationships are not yet perfectly clear. The conspicuous feature of all these is the rudimentary condition of the wings, so that the ratites are well-designated flightless birds, the disappearance of the tail and the great prominence of the functions and development of the legs and feet. These features are believed to be the result of changes, very long continued, from ancestors which possessed the power of flight and have lost it by disuse, and in adaptation to life upon plains and deserts. This group was introduced by Merrem in his ‹Attempt at a Natural System of Birds,› and contains his genus ‹Struthio,› since divided. Consult Evans, ‹Birds› (1900); Newton, ‹Dictionary of Birds› (1893–96); Stejneger, ‹Standard Natural History› (Vol. IV, 1885).

**RATKE,** rät-kė, **Wolfgang** (better known by his Latinized name of Ratichius), German educator: b. Wilster, Holstein, 18 Oct. 1571; d. Erfurt, 27 April 1635. He was trained in the Johanneum at Hamburg and the University of Rostock. Between 1603 and 1611 he lived in Holland and was the inaugurator of a new plan of school reform. The essence of his system was to discard the old memory and rote method of teaching children; to interest them, by presenting things to their observation, and, afterward, names — a reversal of the method then in vogue; to teach them their mother tongue first and thence proceed to foreign languages. At first he met with little success in propagating his views. In 1618, however, he settled at Köthen, Anhalt, and Prince Ludwig von Anhalt furnished him with the means of opening a school to be conducted according to his own ideas. Owing to certain faults of his own, as well as to the unsettled religious condition of Germany at that time, he was obliged to leave Köthen and settled at Magdeburg in 1721. Here he made a second failure and afterward led a somewhat wandering life. But his influence upon his contemporaries and posterity was much greater than would be supposed from the failure of his own attempts to put his plan in practice. Consult Krause, ‹Wolfgang Ratke, im Licht seiner und seiner Zeitgenossen Briefe› (1872); Schumann, ‹Die echte Methode W. Ratkes› (1876).

**RATON,** ra-tōn', N. Mex., city, county-seat of Colfax County, on the Atchison, Topeka and Santa Fé Railroad, about 130 miles northeast of Santa Fé and eight miles south of the northern boundary of the State. In the vicinity are extensive coal fields. It is the commercial and industrial centre of a large region devoted chiefly to farming and stock raising. It has railroad shops, stock-yards, grain elevators, wholesale houses and brick and lumber yards. Pop. (1920) 5,544.

**RATTAN,** răt-tăn, a product of *Calamus rotang,* a scandent palm of Ceylon, but also found in India and Burma. While this species furnishes the best commercial rattan, there are about 200 species in this genus, inhabiting tropical and subtropical Asia, Africa and Australia. The most important species other than the above are *C. rudentum, C. pachystemonus* and *C. radiatus,* abounding throughout the damp forests of Ceylon up to 3,500 feet elevation. *C. rotang* and the first two species named above are manufactured into a great variety of useful articles such as baskets, chairs, the hoods of carts, and when split into strips can be twisted into cordage of great strength. *C. rotang* is often used in Eastern countries for rope bridges, or, used entire, is stretched across rivers as the supports of suspension bridges; and is also employed for the manufacture of Malacca canes. In China rattan is a favorite material for cordage, and the material also enters into the manufacture of umbrella handles and ribs, and as a substitute for whalebone. The cane is used for saddlery and harness and for wickerwork helmets, said to be sword-proof. The two smaller species (*C. pachystemonus* and *C. radiatus*) are largely employed in the manufacture of baskets for the Ceylon tea gardens, used in picking the tea leaves. *C. radiatus* supplies the material for chair bottoms, being split into thin strips. In fact the many uses of rattan in Eastern countries are almost nameless. In the United States rattan is largely used for manufacturing chairs and other furniture, for chair-seating, baby-carriage bodies, baskets, floor mattings, brooms, corset-stays, whips and many other uses of minor importance. The «reed» used in raffia fancy-basket manufacture is the split inner portion of rattan dressed in cylindrical form like the true reeds. See also Fibre.

**RATTANY,** or **RHATANY,** a coarse plant of the genus *Krameria* and order *Polygalæ,* native to the Andean table-lands in Peru and Bolivia. The roots have medicinal value as an astringent, when finely powdered they furnish a frequent constituent of tooth-powders, and they also serve, especially in Portugal, to color wines ruby-red. This property is due to the presence of ratanhia tannic-acid. The root-bark also contains an almost insoluble free red substance called ratanhia-red.

**RATTAZZI,** rät-tät'sē, **Marie Studolmine de Solms,** French novelist: b. Waterford, Ireland, 1833; d. Paris, February 1902. She was the daughter of Sir Thomas Wyse, British Ambassador to Greece, and Letitia, eldest daughter of Lucien Bonaparte. She was married to Frederic de Solms, a rich native of Alsace in 1850, to Urbano Rattazzi (q.v.) in 1863 and to M. de Rute in 1877. Twice, in 1852 and 1864, she was exiled. She wrote much in prose and verse, and was a prominent figure in politics and society. She was one of the first woman journalists; for four years she wrote a feuilleton for the *Constitutionel,* and also wrote for the *Pays* and the *Turf.* In the early days of the Second Empire she was a woman of great personal beauty and gathered around her in her salon men of all shades of opinion — Hugo, Rochefort, Semenuais, Sue, About, etc. In Italy she was called the ‹Divina Fanciulla.› In 1881 she edited ‹Rattazi et son Temps,› and in the last two or three years of her life she published two volumes of her own memoirs, and edited the *Nouvelle Revue Internationale,* to which she also contributed largely. Among her other works were ‹Les Mariages d'une Creole› (1864); ‹Si j'etais Reine› (1868); ‹L'Aventurier des Colonies› (1885), a drama; and the volume of tales, ‹Enigme sans Clef› (1894).

**RATTAZZI,** rạt-tät'sē, **Urbano,** Italian statesman: b. Alessandria, 29 June 1808; d. Frosinone, 5 June 1873. He studied law at Turin and, after practising with marked success at the capital and at Casale, was elected a member of the Sardinian Parliament from his native town in 1848. He allied himself with the Liberal party and attained such speedy recognition that in August he was made Minister of Public Instruction. He left office after a few days, but in December of the same year assumed the portfolio of the Interior under Gioberti, exchanging it later for that of Justice. On the fall of the Gioberti ministry, Rattazzi was entrusted with the formation of a new cabinet (February 1849) but the disaster of Novara in the following month robbed him of power. From Democrat he now turned Moderate Liberal and formed the party of the left centre whose coalition with the right centre under Cavour (q.v.), the so-called «connubio,» brought about the fall of the d'Azeglio Cabinet in November 1852 and the organization of a new ministry by Cavour. Rattazzi gave up the presidency of the Chamber to become in 1853 Minister of Justice, and later, of the Interior, and in the second capacity precipitated a bitter struggle with the Clerical party by the introduction of a law providing for the partial secularization of church property and restricting the influence of the religious associations. He left the cabinet in 1858 but in July of the following year, after Villafranca, succeeded Cavour as head of the cabinet, only to give place to his predecessor within six months. His opposition to the cession of Savoy and Nice to France led to his retirement in 1860, but changing his views on this policy he became president of the lower chamber in the first Italian Parliament and in March 1862 succeeded Ricosoli in the government, retaining for himself the portfolios of Foreign Affairs and of the Interior. His course in checking the patriotic agitation against the Austrians in Lombardy and the papal rule in Rome brought him great unpopularity and in December 1862 he retired from office. Once more he succeeded Ricosoli, as Premier, in 1867, but again had to yield to the storm of popular anger aroused by his hostile attitude toward Garibaldi (q.v.) and he resigned in October of the same year.

**RATTIGAN,** Sir **William Henry,** English jurist: b. Delhi, British India, 4 Sept. 1842; d. London, 4 July 1905. He was educated at King's College, London; admitted to the bar in 1873; served four times as judge of the chief court of Punjab; was additional member of the supreme legislative council of India 1892–93, and member of the Punjab legislative council 1898–99. In 1895 he was knighted and in 1901 became member of Parliament for northeast Lanarks. He published ‹De Jure Personarum› (1873); ‹The Science of Jurisprudence› (3d ed., 1892); ‹Private International Law› (1895), etc.

**RATTLESNAKE,** a distinctively American group of poisonous serpents characterized by a peculiar horny rattle appended to the tail. They belong to the suborder *Solenoglypha,* all the members of which are poisonous and have the fang-bearing maxillary bones erectile. To this suborder belong the Old World families of *Viperidæ* (vipers) and the *Crotalidæ,* or pit-vipers, which inhabit both hemispheres. The latter have the maxillary bone deeply excavated to lodge a sensory pit of unknown function opening on the face between the eye and nostril. There are two subfamilies, the *Lachesinæ,* which have no caudal rattle, and the *Crotalinæ,* or rattlesnakes. The former includes the copperhead, water moccasin and fer-de-lance (qq.v.). the banana snake, whose presence in bunches of this fruit so often causes consternation on fruit ships and in storage houses, and numerous others of tropical America, India and the Malay Islands.

The *Crotalinæ,* or rattlesnakes, represent the highest type of serpent development and specialization. The caudal rattle, from which they take their name, consists of a series of dry horny epidermal rings so loosely fitted that any movement causes them to knock together with a sharp rustling rattle. They are formed in the following manner: Several of the terminal vertebræ of the tail are coalesced to form a dilated vertically enlarged plate. This is covered with a thick vascular skin so cut by an annular constriction as to form a larger anterior, and a smaller posterior knob, which together may be considered to be a mold on which the joints of the rattle are formed. The epidermis covering this region is especially thick, and in the young snake forms a button and ring, which are the only indications of the rattle. When the snake sloughs, the horny covering is loosened here as elsewhere and a new layer is formed beneath it; but instead of being cast off with the rest of the epidermis, the open end of the old horny ring fits over and by its elasticity clasps the new knob at the end of the tail, and by this means remains attached. With each subsequent molt a new ring and button are added, the latter serving to hold its predecessor in the series, and which continues to increase in size with the growth of the snake and its caudal knob. As well-fed snakes may slough three or four times a year, and as the rings sooner or later become worn out and detached, it is evident that the popular belief that the number of joints in the rattle indicate the years of the snake's age is unfounded. Rattles of more than 12 joints are rare, but one having 21 is known. When the snakes are irritated or angry, the end of the tail is more or less elevated and vibrated rapidly, producing a sound audible at a distance of 30 or 40 paces. Many snakes, both venomous and innocuous, have this habit of vibrating the tip of the tail when angry and many have a hard horny spur or cap at its end, but no others retain this through a succession of molts. Many fantastic theories have been proposed in explanation of the utility of the rattle, but it is probably little more than a recognition character, which helps to bring the sexes together and to segregate the species. However, it is probable that its sounding formerly saved the lives of many rattlesnakes by warning large animals acquainted with their deadly powers from the vicinity, but since the advent of the white man it has had a precisely opposite result.

**Poison.**— The venom apparatus of the rattlesnakes is the most complete and effective contrivance imaginable for injecting the poisonous fluid into the circulation of a victim. The maxillary bones are very short and are freely movable on an articulation with the prefontals. Upon them are attached the venom fangs at such an angle that with the movements of the maxillary they may be depressed in a fold of mucous membrane or erected vertically in the very front of the mouth in a most effective position for striking. The tooth substance of the fang is folded into a tubular form, with an opening at the base to receive the end of the venom duct and another near the front face of the needle-pointed tip. Behind the functional fang, which may be nearly an inch long in large snakes, is a succession of smaller reserve fangs, which become functional in order as their predecessors are lost. The venom gland, which corresponds to the parotid salivary gland of other animals, is situated on the cheek and has a duct running to a sinus at the base of the fang. All of the muscles and other parts are so arranged that the same movements that open the mouth and press the horizontal pterygoid bones forward to erect the maxillaries with their fangs also compress the poison gland and squeeze out its secretion. Cope describes the biting movement as three-fold: «First, there is the spring of the body, which never exceeds two-thirds of its length; second, the bite proper, caused by the seizing of the jaws; and, third, the clutch with the fangs themselves, which are moved freely backward and forward.» This movement of the fangs may be easily seen by holding a rattlesnake so that it cannot strike, when drops of the pale yellow venom may be seen to fall from their tips and are sometimes blown from the mouth by forcible expirations. The active principles of the venom are several soluble proteids, one of which has a disorganizing effect on tissues with which it comes in contact and another is a powerful heart and respiratory depressor. The immediate effect of a bite is severe burning pain followed in 10 or 15 minutes by prostration, with dizziness, vomiting and cold sweats; the heart action is very feeble and the pupil dilated. This condition gives way in from 12 to 15 hours to one of fever and difficult respiration, while the part affected becomes greatly swollen and the neighborhood of the wound suppurates. Death may occur in either of these stages or as a result of secondary gangrene. Treatment to be effective must be prompt and thorough. A ligature should be applied above the wound and the latter enlarged with a clean knife until the blood flows freely. Permanganate of potash, bleaching powder, chromic acid, silver nitrate or other substances which render the active albumens insoluble should be applied to the wound. Small and frequent doses of whisky, strychnine or ammonia should be administered as a stimulant, but an excess of alcohol may increase the depression. Every effort should be made to press or draw the poison from the wound before the ligature is removed, but sucking with the mouth is always dangerous.

**Species of Rattlesnake.**— Of rattlesnakes three species of *Sistrurus* and 16 of *Crotalus* have been described, three of which are South and Central and the rest North American. None occurs in the West Indies. The species of *Sistrurus* are small snakes with the snout and frontal region of the head covered with large plates. The ground rattlesnake or massasauga (*S. catenatus*) is found on low prairie lands from Ohio and Minnesota southward, but is now rare or exterminated in all settled parts. It reaches a length of three feet and is not considered especially dangerous. About six young are born alive in September; and this is one of the snakes for which it is pretty clearly established that the newly-hatched young seek refuge from danger in the mouth and gullet of the mother. A related species (*S. miliarius*) is found in the Southern States.

In the genus *Crotalus* the entire top of the head is covered with small scales. The common or banded rattlesnake (*C. horridus*) was formerly abundant throughout the entire eastern United States and it is the only species found in southern New England and the Middle States, but has been largely exterminated by the white man and his companion, the hog. The latter in roaming the woods in search of mast, etc., never fails to kill and devour the rattlesnake whenever possible. It is commonly believed that the hog is immune to snake-bites, but the truth is that the poison is dissipated in the thick skin and layer of subcutaneous fat and never reaches the vascular tissues beneath. This rattlesnake prefers sparsely wooded rocky ridges with sunny exposures and in such localities is still common in the mountains from Pennsylvania to Tennessee. It is a sluggish and generally peaceful creature, and seldom bites except to secure food, unless it be trod upon or startled. When about to strike it coils with the head in the middle and elevated and the rattle sounding, delivers a lightning-like blow and immediately recoils or slowly retreats. It seldom attacks without provocation or follows a foe. All kinds of small mammals, especially mice, and occasionally birds, are its food, and it drinks water freely. The cold months of the year are passed in hibernation and frequently large numbers of these snakes congregate in caves or beneath rocks for this purpose. Mating takes place in the early summer and about September from six to nine young about nine inches long are born alive. A length of five feet is sometimes attained, but ordinary examples seldom exceed four. Among the natural enemies of the rattlesnake are the kingsnake and blacksnake, birds of prey and herons. The diamond or water rattlesnake (*C. adamanteus*) reaches a length of more than eight feet and a circumference of 15 inches and is not only the largest of the rattlesnakes, but the bulkiest of all poisonous snakes, being exceeded in length only by the slender snake-eating cobra. It inhabits the Southern States and is particularly abundant on the Florida Keys. Except that it prefers the vicinity of water, in which it swims freely, its habits are much like those of the common species. Because of its great size, and the large amount of venom that it secretes, this is an extremely dangerous reptile; it is also sometimes inclined to be aggressive. The prairie rattlesnake (*C. confluentus*) inhabits most parts of the Western plains and deserts and is exceedingly abundant in unsettled regions. This is the species which plays a part in the famous triple alliance of prairie-dog, owl and rattlesnake, which, although popularly supposed to be a most amicable arrangement, is at best a state of armed neutrality and frequently of open warfare. The owls and snakes seek the burrows of the marmot as safe retreats and nesting sites, as well as for the purpose of feeding on the young marmots, while the latter frequently show their resentment of the intrusion in a variety of ways. A very distinct species is the horned rattlesnake (*C. cerastes*), in which the superciliary scales are produced into a pair of prominent horns surmounting the eyes. It is abundant in the desert region of the Southwest, especially about Death Valley, and is known in Arizona as «sidewinder» from its peculiar habit of retreating sidewise from an intruder. Several other species inhabit these hot dry regions.

**Service to Man.**— Rattlesnakes possess a certain economic importance. As checks on the increase of the native mice and rats, they, in common with many other snakes, perform an important service. Their venomous qualities are such a menace to man and beast as to render their destruction both expedient and certain in all thickly settled districts. By the Indians and by the whites in certain parts of the South their flesh is relished; an oil or salve, supposed by the credulous to possess peculiar medicinal virtues, is claimed to be manufactured from their livers and other fatty parts; and the use of the skin for making purses, belts and other small articles is well known. Certain tribes of Indians employ these snakes in their ceremonials and others formerly poisoned the tips of their war-arrows with rattlesnake venom, while the rattles always figured among the charms of the medicine-man.

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**RATTLESNAKE ROOT.** See Polygala.

**RATTLEWING**, a duck. See Golden-eye.

**RATTRAY**, răt'rā, **William Jordan**, Canadian journalist: b. London, England, 1835; d. Toronto, Canada, 26 Sept. 1883. He went to Canada with his parents in 1848, was graduated from the University of Toronto in 1858 and engaged in journalism as an editorial writer on the Toronto *Mail*. He also contributed to the *Canadian Monthly* and other periodicals and established a reputation as an able defender of Christianity against agnosticism. Author of 'The Scot in British North America' (4 vols., 1883).

**RAU**, row, **Charles**, American archæologist: b. Verviers, Belgium, 1826; d. Philadelphia, Pa., 25 July 1887. He was educated at the University of Heidelberg and came to this country in 1848, where he engaged in teaching. From 1875 until his death he was curator in the National Museum at Washington, D. C., and devoted himself to the study of American archæology, on which he became a recognized authority. He wrote 'Early Man in Europe' (1876); 'The Palenque Tablet in the United States National Museum' (1879); 'Articles on Anthropological Subjects, 1853–1877' (1882). He left unfinished a work on the types of early American implements, and what was projected to be an exhaustive record of American archæology. His great library and collections were bequeathed to the National Museum.

**RAU**, **Karl Heinrich**, German political economist: b. Erlangen, 1792; d. 1870. He received his education at the University of Erlangen, was privat docent there in 1812, becoming professor of political economy there in 1818. Four years later he removed to Heidelberg in a similar capacity. In 1835 he founded the *Archiv der politischen Oekonomie und Polizeiwissenschaft*. He is the author of 'Ueber das Zunftwesen und die Folgen seiner Aufhebung' (1816); 'Grundriss der Kameralwissenschaft und Wirtschaftslehre' (1823); 'Lehrbuch der politischen Oekonomie' (1826–37).

**RAUCH**, rowch, **Christian Daniel**, German sculptor: b. Arolsen, western Germany, 2 Jan. 1777; d. Dresden, 3 Dec. 1857. In Arolsen he received his first instruction in art from the sculptor Valentin, under whom he executed ornamental work chiefly. Going to Cassel he became a pupil of Kuhl, the sculptor, and was appointed groom of the chamber in the king's household at Berlin. This gave him an opportunity of advancing in his art, and in 1802 he exhibited his 'Sleeping Endymion' and modeled a bust of Queen Louise (1804), which he subsequently executed in marble at Rome. In this city he found a patron in Humboldt, as well as in the first sculptors of the time, Canova and Thorwaldsen. Among his Roman work of early days must be mentioned the busts of the poet Werner, the life-sized busts of Queen Louise, Count Wenyerski, the painter Raphael Mengs, executed under the commission of Ludwig of Bavaria, and the bassi-relievi of ‹Hippolytus and Phædra› and ‹Mars and Venus Wounded by Diomedes.› By 1824 he had executed 70 busts in marble of which 20 were of colossal size. His colossal bronze statues of Blücher are 13 feet in height, and he also executed the greater part of the 12 statues in iron which compose the national monument at Kreuzberg, near Berlin. One of his finest works is the group ‹Faith, Hope and Charity,› which he presented to his native town, Arolsen, while his crowning work as a portrait and historic sculptor is his statue of Frederick the Great at Berlin (1851), the result of 20 years' labor. He was one of the first, if not the very first, among German sculptors of his time, combining in his work the pure lines of transcendent dignity and grace with genuine portraiture of the individual. There is a poetic freedom in his conception of ideal subjects which does not yet overstep the limits of truth and fidelity to nature, and he may be safely styled the founder of the great Berlin school of sculpture. Consult Eggers, ‹Chr. n. Rauch› (1873); ‹Rauch und Goethe, urkundliche Mitteilungen› (1880).

**RAUHES HAUS,** row'ĕs hows (corrupted from «Ruges Haus»), an educational and benevolent institution at Horn, near Hamburg, founded in 1833 by Johanie Heinrich Wichern (1808–81), who long remained at its head. It is connected with the German Home Mission, and besides forming a refuge for neglected children receives boarding pupils from the higher classes, and serves as a training school for those wishing to become teachers, superintendents or assistants in hospitals, reformatories, houses of correction and the like. It is supported by voluntary contributions, the profits arising from the productive enterprises carried on in connection with it and the fees of the richer pupils. In recent years there has been an average of 100 poor and neglected children, about one-third girls, receiving instruction within its walls. They live in «families» of from 12 to 15, each «family» being under the care of one of the adult members of the mission training school. The educational department is in the hands of assistants, who also take part in the instruction of the institution, in order to prepare themselves for the work of the Home Mission in other localities. This indeed has became one of the most important features of the work carried on by the Rauhes Haus, and its graduates are found in every field of charitable work in Germany. The whole staff of assistants, consisting of young men of 20 to 29 years of age, are formed into a kind of society (*Brüderschaft*). Since 1844 the institution has carried on a printing and book-binding business. Its organ is the *Fliegende Blätter.*

**RAUM,** rowm, **Green Berry,** American lawyer: b. Golconda, Ill., 3 Dec. 1829; d. Chicago, Ill., 18 Dec. 1909. He was admitted to the bar in 1853; removed to Kansas and served in the Union army in the Civil War, rising to the rank of brigadier-general of volunteers. He sat in Congress 1866–69; was commissioner of internal revenue 1876–83, and United States commissioner of pensions 1889–93. He published ‹The Existing Conflict between Republican Government and Southern Oligarchy› (1884); ‹History of Illinois Republicanism› (1900).

**RAUMER,** row'mĕr, **Friedrich Ludwig Georg von,** German historian: b. Wörlitz, near Dessau, Anhalt, 14 May 1781; d. Berlin, Germany, 14 June 1873. He studied law at Halle and Göttingen, and entered the Prussian state service in 1801. In 1811 he accepted the chair of political economy at Breslau, and in 1819 was called to Berlin. He was for some time secretary of the Berlin Academy, and at different times between 1816–55 traveled extensively through Europe and the United States. In 1848 he was elected to the Parliament of Frankfort, and was sent to Paris as Ambassador. He was a member of the House of Lords of Prussia from 1851 until his death. He founded and edited in 1830–67 ‹Historisches Taschenbuch.› The first scientific historian to popularize history in German, Von Raumer wrote ‹Geschichte der Hohenstaufen und ihrer Zeit› (1823–25); ‹Briefe aus Paris zur Erläuterung der Geschichte des 16 und 17 Jahrh› (1831); ‹Ueber die geschichtlich Entwickelung der Begriffe von Recht, Staat und Politik› (1832); ‹Geschichte Europas seit dem Ende des 15. Jahrhunderts› (1832–50); ‹Beiträge zur Neuern Geschichte aus dem Brit. Museum, etc.› (1836–39); ‹Die Vereinigten Staaten von Nordamerika› (1845); ‹Handbuch zur Geschichte der Litteratur› (1864–66), besides special works on ‹Prussian Municipal Law› (1828); ‹England, 1835› (1836); ‹England, 1841› (1842), and ‹Italy› (1840).

**RAUMER, Karl Georg von,** German geologist and educator, brother of the preceding: b. Wörlitz, Germany, 9 April 1783; d. Erlangen, Germany, 2 June 1865. He was educated in Göttingen, Halle and Freiberg, and in 1811 became professor of mineralogy at Breslau, was called to Halle in 1819 and in 1827 settled permanently as professor of natural history at Erlangen. He published ‹Geognostische Fragmente› (1811); ‹A B C Buch der Krystallkunde› (1817, 1821); ‹Lehrbuch der allgemeinen Geographie› (1832); ‹Geschichte der Pädagogik› (1843–51); ‹Beschreibrung der Erdoberfläcue› (6th ed., 1866), etc. Consult his autobiography (1866).

**RAUMER, Rudolph von,** German philologist, son of Karl Georg von Raumer: b. Breslau, Germany, 14 April 1815; d. Erlangen, Germany, August 1876. He was privat docent at Erlangen in 1840–46; professor there in 1846–76, and published ‹Untersuchungen über die Urverwandtschaft der semitischen und indo-europäischen Sprachen› (1868 et seq.).

**RAUPACH,** row'päн, **Ernst Benjamin Salomo,** German dramatic poet: b. Straupitz, near Liegnitz, 21 May 1784; d. Berlin, 18 March 1852. He studied theology at Halle, afterward went as a tutor to Russia, and in 1816 obtained a chair in the philosophical faculty of the University of Saint Petersburg; but quitted the country in 1822, and after various changes finally settled, in 1824, in Berlin, where he employed himself chiefly in writing for the stage. His dramatic works have been collected and published in two divisions, the one containing his comic pieces, under the name of ‹Dramatische Werke komischer Gattung' (1828–35); and the other, 'Dramatische Werke ernster Gattung' (1830–43). In his earlier works he was an imitator of Schiller, and some of the tragedies belonging to this period, such as 'Die Erdennacht,' show much real power. His popular success was considerable; but his dramas became more and more trivial in content. They display, however, considerable knowledge of stage effect, great creative power and a wealth of verbal wit. His early plays include 'The Princess Chawansky' (1818); 'Die Gefesselten' (1821); 'Der Liebel Zauberkreis' (1824); 'Isidar und Olga' (1826); and 'Die Tocuter der Luft' (1829); his comedies 'Die Schleickhändler'; 'Der Zeitgeist,' and 'Das Sonnett'; his farces 'Deuken Cäsar,' and 'Schelle im Monde'; his posthumous works 'Jacobine von Holland,' 'Der Kegelspider,' 'Mulier taceat in Ecclesia' (1853), and 'Seed and Fruit' (1854). A life of the dramatist was published by Pauline Raupach (1853).

**RAUPP,** rowp, **Karl,** German painter: b. Darmstadt, 1837. He began as a landscape painter, and between 1856 and 1858 studied genre under J. Becker at Frankfort, and under Karl Piloty at Munich Academy from 1860 to 1865. Subsequently he opened a studio, taking private pupils in painting, and in 1868 his reputation as a teacher gained for him the position of professor in the art school at Nuremberg, which he held up to 1879, when he was appointed professor in the academy at Munich. Among his works may be mentioned 'A Boating Party on the Chiem See'; 'Home Before a Storm'; 'A Calm'; 'Ave Maria'; 'Sport and Work'; 'Starting Home from the Monastery School.'

**RAUSCHENBUSCH,** rou'shĕn-bŭsh, **Walter,** American clergyman: b. Rochester, N. Y., 4 Oct. 1861; d. 25 July 1918. He was educated at the classical gymnasium, Gutersloh, Germany, the University of Rochester and the Rochester Theological Seminary, and was ordained in the Baptist ministry in 1886. He was engaged in religious work among German immigrants in 1886–97, and in educating German pastors in 1897–1902. After 1902 he was professor of church history at the Rochester Theological Seminary. He lectured at Berkeley College, Cal., in 1910; at the Ohio Wesleyan University in 1911 and at Grinnell College in 1914. Author of 'Christianity and the Social Crisis' (1907); 'Prayers of the Social Awakening' (1910); 'Unto Me' (1912); 'Dare We Be Christians?' (1914); 'Theology for the Social Gospel' (1917), etc.

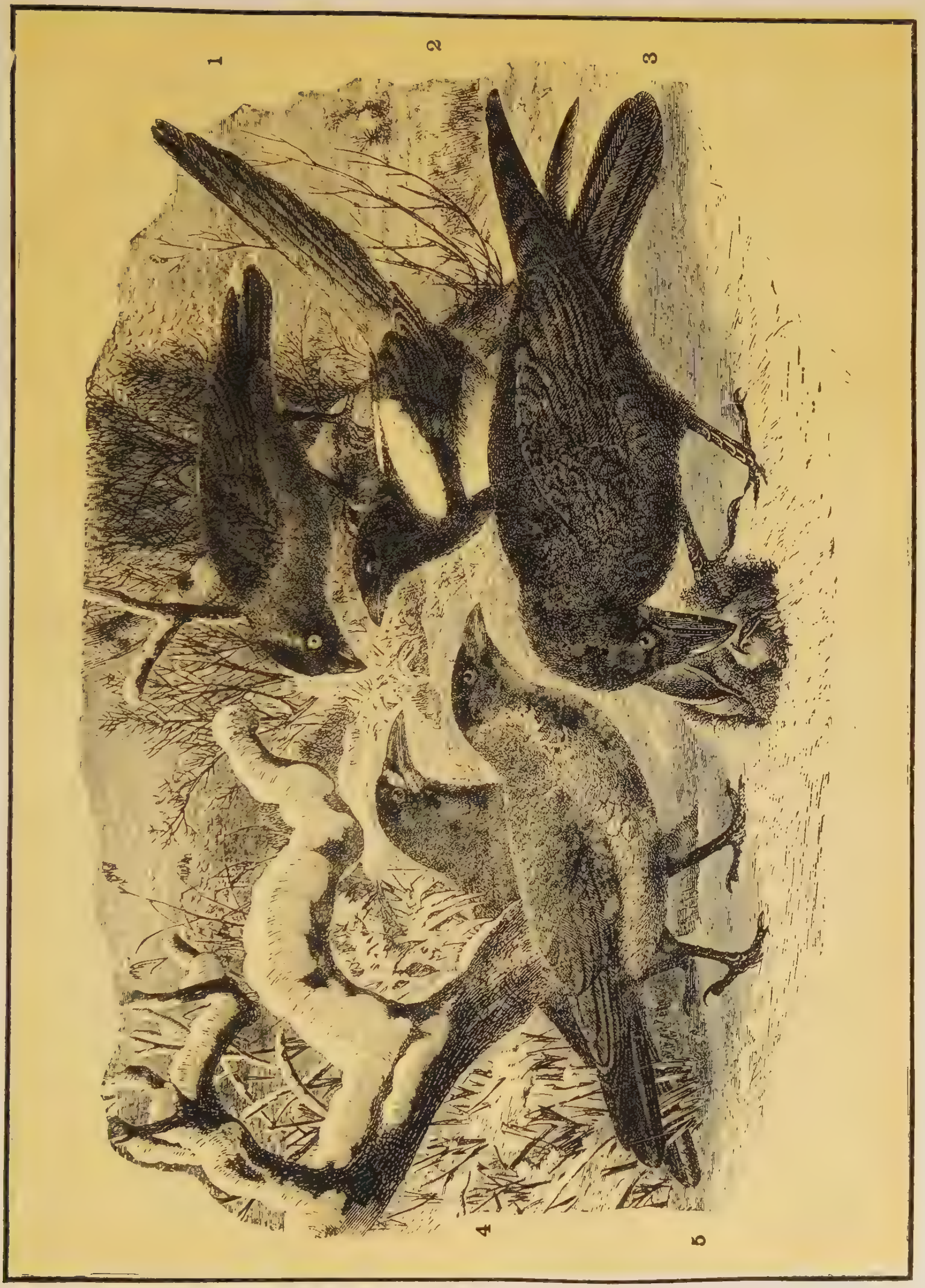
**RAVAILLAC, François,** fräñ-swä rä-vä-yäk, French assassin: b. Touvres, near Angoulême, 1578; d. Paris, 27 May 1610. He was successively valet to an attorney, in which situation he learned to read and write, attorney's clerk and schoolmaster. He could never succeed in any undertaking, however, and was thrown into Angoulême prison for debt, where he remained for a considerable time. At last he was released, and turned out into the world a beggar. He entered the order of the Feuillants, but was expelled shortly afterward as a visionary. His naturally gloomy disposition degenerated into fanaticism when he began to meddle in the religious controversies that distracted France. He came to consider King Henry IV as the arch enemy of the Church, to destroy whom would be a meritorious work. On 14 May 1610, while the king's carriage was standing in the street, Ravaillac approached and stabbed him. He was condemned to be torn to pieces by four horses, and this he underwent, previously declaring that he had no accomplices to his crime. Henri Martin in his 'Histoire de France' and M. Poirson in his 'Histoire de Henri IV' concluded, after an examination of all available evidence, that the crime was wholley due to monomania, resulting from fanaticism.

**RAVANA,** rä'vä-nä, in Hindu mythology, one of the Rakshasa, a class of evil spirits or demons, who, as attendants on Kuvera, the god of riches, were guardians of his treasures, and had the power of assuming any shape at will. They were cruel, hideous monsters, ever ready to oppose the gods. At the time of Rama, Ravana ruled over Lanka, or Ceylon, and having carried off Sita, the wife of Rama, to his palace, was ultimately conquered and slain by the latter. He is described as a giant with 10 faces, who in consequence of austerities and devotion had obtained from Siva a promise which bestowed on him immunity from the power of demons and gods. Vishnu became incarnate as Rama, and hence killed the demon giant, whose kingdom had been invaded by men with the assistance of monkeys, against whom Ravana, in scorn, had omitted to make any stipulations in his compact with Siva.

**RAVEN,** a typical species (*Corvus corax*) of the crow family (*Corvidæ*), of which, as indeed of all passerine birds, it is the largest representative. The size is quite variable, but is generally about two feet in length and four feet in expanse. Plumage, bill and feet are all black, the former with rich purple and violet lustres, but duller in the young and females, which are likewise smaller. The raven inhabits Europe, a large part of Asia, and North America from the Arctic Ocean to Guatemala. In North America two sub-specific forms are found, *C. corax sinuatus* being the western, and *C. corax principalis* the larger northern and eastern race. The former is generally abundant in the Rocky Mountain region; the latter has been largely exterminated in the eastern United States, but is still found in many inaccessible waste and mountain districts and reaches a very large size in Labrador and northward. Northwardly the raven is migratory, but may withstand the cold of the severest winters, as it often does in Canada and about the Great Lakes.

It is most abundant in rocky districts, near the banks of lakes and rivers, and is generally seen alone or in pairs, but sometimes in small flocks after the breeding season; the flight is rapid, elevated and protracted, often sailing for hours at a time at a great height; on the ground the gait is grave and dignified, with frequent opening of the wings. It is truly omnivorous, but by preference carnivorous, eating small animals of all kinds, eggs and young birds, carrion, dead fish, mollusks, crustaceans, insects, nuts and berries. The European raven is reputed to destroy young rabbits and even lambs. It disgorges indigestible substances, as bones, hair and feathers, like birds of prey. It is very wary and cunning and is rarely caught in traps or shot by the hunter, but it often falls a victim

RAVEN TRIBE



1 Jackdaw 2 Magpie 3 Raven 4 Rook 5 Gray Crow

to the poisoned baits set by the trappers for the fur-bearing animals. It breeds according to latitude, between January and June, making a rude nest on inaccessible cliffs or tall trees, repairing the same for years in succession: the eggs are four to eight, two inches long, light greenish blue with numerous light purple and yellowish brown blotches, especially at the larger end; incubation lasts about three weeks, and the young remain in the nest several weeks before they are able to fly, fed at first on the half digested food disgorged by the parents; only one brood is raised in a year, and this is bravely and successfully defended against the largest birds of prey. The raven is easily domesticated by kindness, and becomes much attached to its master, following him like a dog. Like others of the family it can be taught to imitate the human voice and to pronounce a few words with great distinctness; but the natural note is a deep, hoarse croak. The white-necked raven (*C. cryptoleucus*) of Mexico and the southwestern United States has the concealed bases of the neck feathers pure white. Several other raven-like species inhabit Africa. The large size, black color, mournful croak, charnel-house habits, together with the boldness, sagacity and wariness of the raven, have combined to make it an object of superstitious fear and hate. As a bird of ill-omen it was watched by the ancient augurs with close attention; it holds a prominent place in mythology and folklore, and receives frequent notice in literature.

**RAVEN, The.** ‹The Raven› by Edgar Allan Poe is the one of his poems which is most inseparably connected with his name in common recollection. It is entirelv expressive of the dominant sentiment of his life, the longing and regret for beauty which he had once known; it is an excellent example of his most popular qualities as a versifier; and he himself has selected it as a means of explaining how a poet might develop his ideas into poetic form. Like ‹Annabel Lee,› ‹Ulalume› and others of Poe's best-known verse,‹The Raven› is a recurrence of the thought of a beautiful love early known and early lost. In its form it has all the quality of softness and sonorousness, of repetition and refrain which will be found elsewhere in Poe. In ‹The Philosophy of Composition› Poe explains the steps by which these elements were built up and combined into the present poem. It is possible that he tells exactly what took place in his own mind. He was, however, rather fond of hoaxing people; he was also fond of exact intellectual manipulation; and it is very possible that his account is really an after-statement of what might have been. However that may be, the poem is a wonderful example of the emotional, even sentimental, lyric of the middle of the 19th century. It is a mistake to think of Poe's poetry as being more music than meaning. ‹The Raven› has a very distinct meaning although not such as could easily be reduced to a systematic statement. In our own day such reveries and meditations seem sentimental and old-fashioned; a century ago they were the natural moods of hundreds of young men. And no poem in our literature better expresses just the mood that in that post-Byronic day was so common, not even anything by Byron himself. As an expression of its author and its own time ‹The Raven› is perfect. It realises an ideal of beauty which is rare to-day and which many to-day find it impossible to appreciate, but it is an ideal of beauty and it is realised.

Edward Everett Hale.

**RAVENEL, Henry William,** American botanist: b. Berkeley, S. C., 19 May 1814; d. Aiken, S. C., 17 July 1887. He was graduated from South Carolina College in 1832, made a life study of the fungi and cryptogams and became one of the best botonical authorities in the United States. He made a critical study of the phænogams of South Carolina, was botanist of the government commission to Texas in 1869 and was agricultural editor of the *Weekly News and Courier.* The genus *Ravenelia* of the *Uredineæ* is named in his honor. He was credited with being the only American after the Rev. Moses A. Curtis, who knew specifically the fungi of the United States. The University of North Carolina gave him the degree of LL.D. in 1886. He wrote ‹Fungi Caroliniani Exsiccati› (1853–60); and with M. C. Cooke ‹Fungi Americani Exsiccati› (1878–82).

**RAVENNA,** rȧ-vĕn'ạ, capital of the Italian province of the same name, in the compartimento of Emilia, about 45 miles east of Bologna. It is situated on marshy ground which was, within historic times, a lagoon and the scenes of extensive maritime movement. The Corsini Canal and the two non-navigable streams, Montone and Ronco, connect Ravenna with the Adriatic, where there is a harbor at the mouth of the canal. The city has also railway connection with Bologna, on the west, Terrara, on the north, Rimini, on the south coast by the Adriatic Railways, which skirting the west shore of the Adriatic joins Ravenna with Brindisi in the far south. The connection with other places along the shore of the «Boot» is made by the Mediterranean Railways. Ravenna is joined to all the great western centres of commercial activity by lines of railway connecting with the Adriatic Railways. It has extensive parks and gardens, most of which lie outside the compact centre of the city, which is occupied by the Piazza Vittorio Emanuele. This Piazza, and other public squares and parks, possess many interesting statues and other sculptured work. Owing to the fact that it was an imperial, political and ecclesiastical centre for many years, Ravenna is now one of the greatest depositaries of ecclesiastical architectural art in Italy, more especially of the art of the 5th, 6th, 7th and 8th centuries, which is a curious mingling of Roman, early Christian and Byzantine construction. Among the notable ecclesiastical edifices of the city, with the date of completion in each case, are Ecclesia Ursiana, known as the Metropolitan Church (390), San Giovanni Evangelista (425), Santa Agata (435), San Pier Crysologo (450), San Giovanni Battista (450), Nazario Celso (450), San Pier Maggiore (458), also called San Francesco, San Teodoro (526), also known as Santo Spirito, Santa Maria in Cosmodin (526), San Martino (526), now called Apollinare Nuovo, San Vitale (530), Santa Maria Maggiore (530), San Apollinare in Classe (535). The early cathedral, completed in 390, was destroyed toward the middle of the 18th century, and only some small parts of it and some decorations remain incorporated in the modern edifice. From 404 to 455, when Vienna was the official imperial residence, was a period of great architectural activity in the city. This includes six great churches and the Basilica Petriana, which has been demolished. Most of the other churches have been remodeled, added to or almost altogether rebuilt, but they all have incorporated in them interesting reminders of the original structures which preceded them. The modern churches are rich in mosaics, capitals, columns, crypts, frescoes, statuary, wall decorations and other paintings. The close of the period above indicated showed a very decided decrease in the building activity and art creation of Ravenna. But the reign of Theodoric (493–526) again awakened the latent artistic life of the city. Theodoric himself built a huge palace in the eastern quarter of the capital; but this has long since disappeared; and he also erected for himself a massive marble mausoleum at the northeast of the city. This building, which is still standing, is circular, two stories in height and crowned by a monster monolith of more than 300 tons weight. It is now a church dedicated to the Virgin. San Apollinare Nuovo was built by Theodoric himself. In his day it was the largest and one of the handsomest of the Arian churches. The impetus given to building and art by Theodoric was communicated to the reigns of several of his successors. A part of the activity of this period is indicated by the list of prominent churches already cited. The city is rich in remains of the past and of the imperial and ecclesiastical occupations, in museums, tombs and other historical landmarks, among these being the palace and tomb of Theodoric already mentioned, the tomb of Dante and the temple containing it, Lord Byron's house, old Roman and other roads in the neighborhood and buried and partially excavated ruins of the ancient city. Near to the modern city are also remains of the ancient harbor; in the near-by marshes stands the vast ecclesiastical edifice of San Apollinare in Classe, with its fine mosaics of the 6th and 7th centuries. Among the other notable monuments of the city are the granite columns of the Piazza Vittorio Emanuele set up there by the Venetians (1483) and the statues of San Apollinaris and San Vitalis.

**Industries.**—Among the industries of Ravenna are lace manufacture, silk raising, wine manufacture, grape growing, spinning, weaving. The raising of grain, fruit, fishing and the making of glass, leather, bricks, musical and agricultural implements have tended lately to increase the commercial activity of the city.

**History.**— Ravenna is one of the most ancient cities of Italy. Pliny says it was founded by the Sabines. In 191 B.C. it became part of the Roman dominions in Gallia Cisalpina. Augustus made Ravenna one of the important stations for his fleet, and by turning a branch of the Po through the city on its way to the Adriatic, increased the port facilities so as to accommodate a very considerable portion of the «upper sea» fleet, which was apparently composed of vessels of lighter draught, for we are assured that its situation «in the sea,» the devious nature of the water-ways leading to it and their shallowness made it almost impregnable. For this reason and its apparent healthfulness it was the residence of numerous emperors, among them Odoacer, who made his final stand against Theodoric, the leader of the Ostrogoths, sustaining a siege of three years conducted from land and sea. A few days after his surrender he was murdered by Theodoric, who made Ravenna his official residence in 493. During the following 33 years of his reign Theodoric lavished all his care on Ravenna, making it one of the most noted cities in his domains, and the pride of the Goths, who retained their power there for many years after they had lost Rome. In 539 Belisarius conquered Ravenna and added it to the Roman Empire of Justinian, which formed a part of his Byzantine dominions, and to which it was destined to remain joined for over 200 years, as the centre of Byzantine power in Italy. Aistulf the Lombard captured Ravenna in 752 but soon lost it to the Frankish king Pepin. In the 13th century it and the surrounding country became an independent republic; but was afterward subjected successively to the Polentani, the Venetian and the papal authorities, remaining finally part of the papal see from 1509 to 1859, since which time it has formed a part of the Italian union.

**Bibliography.**— Agnellus, 'Liber Pontificatis Ecclesiæ Ravennatis' (written about 840); Allen and Williamson, 'Cities of Northern Italy' (Boston 1906); Blashfield, 'Italian Cities' (New York 1912); Bormann, 'Corpus Inscript' (Berlin 1888); Diehl, 'Ravenne, études d'archéologie byzantine' (Paris 1855); Goetz, 'Ravenna' (Leipzig 1901); Gregorovius, 'Wanderjahre in Italien' (Vol. IV, Leipzig 1892); Gsell-Fels, 'Oberitalien and Mittelitalien' (Leipzig 1912); Pasolini dall' Onda, 'Ravenna e le sue grandi memorie' (Rome 1912), Ricci, 'Ravenna' (Bergamo 1902); Rivoira, 'Origini dell' 'Architettura Lombarda' (Rome 1901); Quast. 'Die altchristlichen Bauwerke Von Ravenna' (Berlin 1842).

**RAVENNA**, Ohio, township, city and county-seat of Portage County, on the Baltimore and Ohio, the Erie and the Pennsylvania railroads, about 28 miles southeast of Cleveland. It is in an agricultural region, and has extensive industrial interests. The chief manufacturing establishments are foundries, machine shops, furniture factories, brick and tile works, electrical supply works, flour and lumber mills, iron and boiler works and cigar factories. It has a large trade in farm, clay and iron products and in livestock. In the vicinity are a number of small and beautiful lakes, which have been made popular outing places. Pop. township, 7,219; city, 5,310.

**RAVENNA GRASS.** See GRASSES IN THE UNITED STATES.

**RAVENSCROFT**, rā'vënz-krŏft, **Edward**, English dramatist, who flourished between 1671 and 1700. He was exceedingly popular in his day, though his work was never original, consisting of translations from older plays, and at times he even borrowed from his own previous works. His first play was 'Mamamouchi' (1671), taken from Molière's 'The Gentleman Citizen.' His plays include 'The Wrangling Lovers' (1676), after Corneille; 'Scaramouch, a Philosopher' (1677); 'King Edward and Alfreda' (1677); 'Ignoramus' (1678); 'Dame Dobson' (1683); 'The Canterbury Guests'

(1695); ‹The Italian Husband› (1698); ‹The London Cuckolds› (published 1783), etc.

**RAVENSCROFT, Thomas,** English composer: b. near London, 1592; d. London, 1635. He was educated for his profession in Saint Paul's choir, and at 15 received the degree of bachelor of music from Cambridge. In 1611 he published a collection of 23 part-songs, under the title ‹Melismata,› which are of remarkable beauty. Musical tradition has ascribed to him the compilation of two earlier works, similar in character to his ‹Melismata,› the ‹Pammelia,› comprising 100 pieces, and the ‹Deuteromelia,› containing 32, both dated 1609. In 1614 appeared his ‹Brief Discourses,› another collection of 20 part-songs to which he has prefixed an essay on the ancient musical modes. In 1621 he published his ‹Whole Book of Psalms,› containing a chant for each psalm, many new, and all harmonized in four parts by Tallis, John Milton (the poet's father), Ravenscroft himself and other musicians. The Roxburghe Club published selections from the ‹Melismata,› ‹Brief Discourses,› ‹Pammelia› and ‹Deuteromelia› in 1823.

**RAVENSHOE,** rā'vĕnz-hō, a novel by Henry Kingsley, published in 1862. The House of Ravenshoe, in Stonington, Ireland, is the scene of this novel; and the principal actors are the members of the noble family of Ravenshoe. The plot is remarkable for its complexity, and the book contains many bits of piquant humor.

**RAVENSTEIN,** rä'vĕn-stīn, **Ernst George,** Anglo-German geographer and statistician: b. Frankfort-on-the-Main, 30 Dec. 1834; d. 13 March 1913. He was educated privately and in 1852 removed to London. In 1855–75 he was engaged in the topographical (now intelligence) department of the War Office, was a member of the council of the Royal Statistical Society in 1877–92 and of the Royal Geological Society in 1894–96. He founded the German Gymnastic Society in 1861 and served as its president for 10 years and in 1882–83 he was professor of geography at Bedford College. He published ‹The Russians on the Amur› (1861); ‹Geographie und Statistik des Britischen Reiches› (1863); ‹Systematic Atlas› (1864); ‹Map, Equatorial Africa› (1884); ‹Handy Volume Atlas› (1895, 1907); ‹The Strange Adventures of Andrew Battell› (1901); ‹A Life's Work› (1908); ‹The New Census Physical, Pictorial and Descriptive Atlas of the World› (1911).

**RAVESTEIJN,** rä'vĕ-stīn, **Jan van,** Dutch painter: b. The Hague, about 1572; d. there, 21 June 1657. He was elected into the old Painters' Guild of Saint Luke at The Hague in 1598; the new guild was organized in 1655, and a Jan van Ravesteijn is enrolled among its members, but this may have been his son who bore the same name. He probably began his artistic studies under Frans Hals. His special department was portrait, in which he took rank among the first painters of Holland. Two large pictures of his with grouped portraits are to be seen in the Hall of the Company of Archers at The Hague; and in that city and at Antwerp are several portraits of individuals. His portrait picture of his own family is at Brunswick. His faces are life-like, his handling vigorous and his coloring transparent, although somewhat too red to be quite natural.

**RAVIGNAN,** rä-vēn-yäṅ, **Gustave Xavier Delacroix de,** French Jesuit pulpit orator: b. Bayonne, 1 Dec. 1795; d. Paris, 26 Feb. 1858. He had already enlisted in the Bourbon cause in 1815, and, after juristic studies, been made auditor of the Paris Supreme Court (1817) and substitute Attorney-General (1821), when in 1822 he entered the Jesuit novitiate at Montrouge. In July 1828 he was ordained priest, and subsequently was professor of theology at Saint Acheul (1828–30) and at Brieg (Canton Wallis), Switzerland. He returned in 1835 to France, where he was for five years head of the Jesuit establishment at Bordeaux. In 1837 he took the place of Lacordaire (q.v.) at Notre Dame, and continued the «conferences» there until 1846. He spoke with much simplicity, but with intense conviction. Crowds flocked to hear him, the cathedral being, it is said, often filled hours before the sermon began. He has been considered one of the greatest preachers of his time. Among his writings were ‹De l'Existence et de l'Institut des Jesuites› (1844; 7th ed., 1855); and ‹Clément XIII et Clément XIV› (1854). Consult the sketches by Poujoulat (1858) and Ponlevoy (1860, 13th French ed., 1890; Eng. trans. 1873).

**RAVINE-DEER,** the name among East Indian sportsmen of the common gazelle of India (*Gazella bennetti*), which is numerous in open rocky places and on the plains from central India to Persia; known also as the duikara, goat antelope and kalsiefie or black-tail. See GAZELLE.

**RAVOGLI, Augustus,** American surgeon: b. Rome, Italy, 7 Feb. 1851. He was graduated from the University of Rome in 1873, studied medicine at Vienna, Prague and Berlin, served as surgeon in the Italian army with the rank of major and came to the United States in 1880. He settled in Cincinnati, Ohio, in 1881 and shortly after became professor of dermatology and syphilography at the University of Cincinnati. He has published numerous scientific articles and ‹The Hygiene of the Skin› (1888), and ‹Syphilis in its Medical, Medicolegal and Sociological Aspects› (1907).

**RAWAL PINDI,** râ'ŭl pĭn'dē, India, in the Punjab, (1), the administrative capital of the division and district of its own name between the Indus and Jhilam, on the railway from Lahore to Peshawar. It is modern in appearance, well-built and an important grain market. There are an arsenal, a fort, a fine public park, several European churches and the headquarters of the Punjab Northern State Railroad. Transit trade is carried on with Cashmere and Afghanistan. The Sikhs surrendered here after their defeat at Gujrat in 1849, and in 1885 a great durbar or review was held during which the queen of Afghanistan and Lord Dufferin, then governor-general of India, met in an important conference. Pop. 86,483. (2) The Rawal Pindi division comprises four districts with a total area of 15,435 square miles. The district contains many towns connected with the campaign of Alexander the Great. Pop. 4,212,794.

**RAWDON, Francis.** See HASTINGS, FRANCIS RAWDON.

**RAWHIDE,** a form of leather in which the curing process stops short of destroying the life of the material. The result is a material remarkable for toughness, durability, tensile strength and pliancy. It is used for belting rope, hydraulic packing, laces of various kinds, pinion wheels, washers, harness, mauls and mallets, trunks, saddles, artificial limbs, whips, lariats, etc.

**RAWLE,** râl, **Francis,** American lawyer: b. Freedom Forge, Pa., 7 Aug. 1846. He was garduated at Harvard in 1869, studied law there and in 1871 was admitted to the bar. He was treasurer of the American Bar Association in 1878–1902, and presided in 1902–03; and was overseer of Harvard in 1890–1902. He is author of articles contributed to legal journals and edited Bouvier's ‹Law Dictionary› (eds., 1883, 1898, 1913).

**RAWLE, William,** American lawyer: b. Philadelphia, Pa., 28 April 1759; d. there, 12 April 1836. He studied law in New York and in London, was admitted to the Pennsylvania bar in 1783, in 1791 was appointed by Washington as district attorney of Pennsylvania, and in 1794 assisted in the prosecution of the offenders in the Whisky Rebellion. He acted as counsel for the United States Bank for many years, was chancellor of the Associated Members of the Bar of Philadelphia, and of the Law Association of that city and was a trustee of the University of Pennsylvania from 1796 until his death. He assisted in the revision of the civil code of Pennsylvania in 1830, was one of the founders of the Historical Society of Pennsylvania in 1824, serving as its first president and was also president of the Abolition Society. His publications include ‹A View of the Constitution of the United States› (1825); ‹Discourse on the Nature and Study of the Law› (1832); A vindication of the Rev. Mr. Heckewelder's ‹History of the Indian Nations›; ‹Biographical Sketch of Sir William Keith›; ‹A Sketch of the Life of Thomas Mifflin›; and a translation from the Greek of Plato's ‹Phædo.› He left in manuscript an ‹Essay on Angelic Influences,› and a dissertation on ‹The Evidences of Christianity.› Consult Wharton, ‹Memoir of William Rawle› (1840).

**RAWLE, William Henry,** American lawyer: b. Philadelphia, 31 Aug. 1823; d. 19 April 1889. He was graduated at the University of Pennsylvania in 1841 and three years later was admitted to the bar, where he rapidly attained prominence. He enlisted in the Union army during the Civil War (1861) and re-enlisted in 1863, then serving as quartermaster. He was vice-provost of the Law Academy (1865–73) and vice-chancellor of the Law Association from 1880 to the time of his death. He published ‹Law of Covenants for Title› (1852); ‹Equity in Pennsylvania› (1868); ‹Some Contrasts in the Growth of Pennsylvania in English Law› (1881); ‹Oration at Unveiling of the Monument Erected by the Bar of the United States to Chief-Justice Marshall› (1884); and ‹The Case of the Educated Unemployed› (1885).

**RAWLING, Cecil,** English general and explorer: b. 1870; killed in action, 28 Oct. 1917. His early military career was spent in India, where he took part in the North-West Frontier campaigns of 1897–98. His «passion for high mountains and the waste places of the earth» led him to surveying work on the Tibetan frontier, where he mapped some 40,000 square miles of territory in 1903 and gained local knowledge that proved valuable in the Tibet Expedition of 1904. With a small party he next explored the northern slopes of the Himalaya and the sources of the Bramaputra, which he traced to its sources. The record of his discovery was published in his book, ‹The Great Plateau.› His next undertaking was an expedition to Dutch New Guinea, where, in the course of an adventurous journey, the party discovered a new pigmy race. The outbreak of the European War prevented him from carrying out a bold plan to attempt the ascent of Mount Everest from the Tibetan side. He raised a battalion himself and fought on the Western Front at Hooge, Ypres and at the Somme. The Royal Geographical Society awarded him the gold medal (June 1917) for his exploring work. He was killed by a stray shell.

**RAWLINS,** rā'lĭnz, **John Aaron,** American military officer: b. East Galena, Ill., 13 Feb. 1831; d. Washington, D. C., 9 Sept. 1869. He took up the study of law and in 1854 began practice in his native town. In 1861, soon after the storming of Fort Sumter, he made a brilliant war speech at a meeting presided over by Ulysses S. Grant, who was so greatly impressed that he requested Rawlins to act as his assistant adjutant-general. He then entered the army and throughout the war was Grant's closest friend and adviser. He took an active part in the campaigns of 1862–63, and was appointed brevet major-general, 13 March 1865. He was a man of marked ability as a soldier, although he never had military training. General Sherman said that Rawlins «was an intense thinker and a man of vehement expressions, a soldier by force of circumstances rather than of education or practice, yet of infinite use to his chief throughout the war and up to the time of his death.» He was Secretary of War during Grant's first administration.

**RAWLINS, Joseph Lafayette,** American legislator: b. Salt Lake County, Utah, 28 March 1850. He received a classical education at the University of Indiana, but was not graduated and was a professor at the University of Deseret in Salt Lake City 1873–75. He was admitted to the bar in 1875 and practised until 1892, when he was a successful candidate for Delegate in Congress. Defeated for a second term in 1895 he was elected to the United States Senate in 1897, where he served till 1903, and was a member of the committees on Foreign Relations, Immigration, Geological Survey, Indian Affairs, Pacific Railroads, Public Buildings and Grounds and the Philippines.

**RAWLINS,** Wyo., city, county-seat of Carbon County, on the Union Pacific Railroad, about 135 miles west by north of Laramie. It is the commercial centre of an extensive stock-raising and mineral region. Its manufactures are chiefly for local use; but the railroad shops give employment to a number of persons. It ships annually a large amount of minerals, sheep, wool and live cattle. The State Penitentiary is at Rawlins. Pop. 4,256.

**RAWLINSON,** râ'lĭn-sŏn, **George,** English Orientalist: b. Chadlington, Oxfordshire, 23 Nov. 1815; d. London, 6 Oct. 1902. Educated at Oxford, he took orders and was made a Fellow and Tutor of Exeter College in 1840. In 1845 he became sub-rector, delivered the Bampton lectures in 1859, and in 1861 was made Camden professor of ancient history. He received from Mr. Gladstone a canonry of Canterbury Cathedral in 1872, and in 1888 accepted the living of All Hallows, Lombard Street, London. An indistinct utterance interfered with his public speaking and his pulpit was mainly filled by proxy. His learning was large and various and his services to biblical scholarship of the highest importance. With his brother, Sir Henry Rawlinson (q.v.), and Sir George Wilkinson he published an annotated edition of Herodotus (1850–60). Among his other works are ‹The Historical Evidences of the Truth of Scripture Records› (1860); ‹The Five Great Monarchies of the Ancient World› (1862–67); ‹Historical Illustrations of the Old Testament› (1871); ‹The Sixth Great Oriental Monarchy, or the Geography, History and Antiquities of Parthia› (1873); ‹The Seventh Great Monarchy› (Persian Empire) (1876); ‹The Origin of Nations› (1877); ‹Saint Paul in Damascus and Arabia› (1877); ‹History of Ancient Egypt› (1881); ‹Religions of the Ancient World› (1882); ‹The Antiquity of Man Historically Considered› (1882); ‹The Early Prevalence of Monotheistic Beliefs› (1883); ‹Egypt and Babylon from Scripture and Profane Sources› (1884); ‹Religious Teachings of the Sublime and Beautiful in Nature› (1884); ‹Ancient History› (1887); ‹Ancient Egypt› (1887); ‹Moses: His Life and Times› (1887); ‹A History of Phœnicia› (1889); ‹The Kings of Israel and Judah› (1889); ‹Isaac and Jacob: Their Lives and Times› (1890); ‹Parthia› (1893); ‹A Memoir of Major-General Sir Henry Creswicke Rawlinson› (1898); and others in the department of biblical commentary.

**RAWLINSON,** Sir **Henry Creswicke,** English diplomatist and Orientalist: b. Chadlington, Oxfordshire, 4 Nov. 1810; d. London, 5 March 1895. He went to Bombay in 1827 as a military cadet in the service of the East India Company, at once applied himself assiduously to the study of the Oriental languages and was soon in request as an interpreter. After five years' service with the First Bombay Grenadiers, he was employed in military work in Persia (1833–39). When the rupture with Persia compelled the withdrawal of British officers from that country he proceeded to Afghanistan and in June 1840 was appointed political agent at Kandahar. Throughout the troubles that ensued he held the southern capital of the Afghans safe from all intrigues within and attacks without. In 1843 he was appointed political agent in Turkish Arabia. His stay in Persia had made him acquainted with the cuneiform inscriptions at Behistun and on being appointed in 1844 consul at Badgad, he set himself to copy and decipher the chief inscription. The result was his great paper on ‹The Persian Cuneiform Inscription at Behistun,› printed in the *Journal of the Royal Asiatic Society* in 1846. Though not without important predecessors in the same field, Rawlinson is justly regarded as the chief founder of the study of Persian cuneiform and the first successful decipherer of cuneiform writings. Having shown great zeal and ability in the discharge of political duties, he was raised in 1851 to the rank of consul-general. Resigning in 1855, he returned to England and in 1856 was created K.C.B., promoted lieutenant-colonel and appointed a crown director of the East India Company. In 1858 he was elected to the House of Commons for Reigate as a conservative and again sat there in 1865–68 as a member for Frome. In 1859–60 he was minister-plenipotentiary at Teheran, in 1889 became a G.C.B., and two years later was created a baronet. Rawlinson received many honors both at home and from foreign countries. He was president of the Royal Asiatic Society in 1878–81 and of the Royal Geographical Society in 1871–72 and 1874–75. His chief published works are ‹A Commentary on the Cuneiform Inscriptions of Babylon and Assyria› (1850); ‹Cuneiform Inscriptions of Western Asia› (1861–80; 2d ed. of Vol. I, 1891), with Norris, E., Smith, G. and Pinches, T. G.; ‹England and Russia in the East› (1875), a strongly anti-Russian pamphlet; notes in the translation of ‹Herodotus› by his brother, George Rawlinson (q.v.), and many papers in the journals of the Royal Asiatic and Royal Geographical Societies. See the ‹Life› by his brother (1898), with an introduction by Earl Roberts.

**RAWNSLEY,** rânz'lĭ, **Hardwicke Drummond,** English Anglican clergyman and poet: b. Henley-on-Thames 28 Sept. 1851. He was educated at Oxford, took orders in 1875, was vicar of Wray, Windermere, 1878–83, and has been vicar of Crosthwaite, Keswick, from the last-named date. Among his many published works are ‹Sonnets Round the Coast›; ‹Sonnets at the English Lakes›; ‹Literary Associations of the English Lakes›; ‹Village Sermons›; ‹Sonnets in Switzerland and Italy› (1899); ‹Memories of the Tennysons› (1900); ‹Ruskin and the English Lakes› (1901); ‹A Rambler's Note Book at the Lakes› (1902); ‹Sketches at the English Lakes› (1903); ‹Flower-time in the Oberland› (1904); ‹The Sacrum Commercium of Saint Francis› (1904); ‹Sermons on the Sayings of Jesus, from the Oxyrhyncus Papyri› (1905); ‹A Sonnet Chronicle, 1900–05› (1906); ‹The European War: Poems› (1915); ‹Past and Present at the English Lakes› (1916).

**RAWSON,** râ'sŏn, **Albert Leighton,** American author and artist: b. Chester, Vt., 15 Oct. 1829; d. New York, November 1902. He studied law, theology and art and traveled extensively in the Orient, later exploring the Indian mounds in the Mississippi Valley, and traveling in Central America and in the Hudson Bay territories. He founded the Theosophical Society in the United States, was adopted into the tribe of the Adwan Bedouins of Moab and initiated by the Druses in Mount Lebanon. His books, illustrated by his own maps and drawings, include ‹Bible Dictionaries› (1870–75); ‹Histories of All Religions› (1870); ‹Antiquities of the Orient› (1870); ‹Vocabulary of the Bedawin Languages of Syria and Egypt› (1874); ‹Chorography of Palestine› (1880); ‹Historical and Archæological Introduction to the Holy Bible› (1884); ‹The Unseen World› (1888); ‹History of Mysticism›; etc. He illustrated Rev. Dr.

Charles F. Deems's ‘Jesus’ (1868), and Rev. Henry Ward Beecher's ‘The Life of Jesus’ (1871). At the time of his death he was completing an elaborate history of Freemasonry. His priceless collection of manuscripts, sketches, photographs and various art treasures were destroyed by fire in 1893.

**RAWSON, Edward Kirk,** American educator: b. Albany, N. Y., 21 Feb. 1846. He was graduated from Yale in 1868, from Andover Theological Seminary in 1872, and was ordained in the Congregationalist ministry. In 1871–90 he was chaplain in the United States navy, serving at the Naval Academy from 1886, and in 1888–90 professor of ethics and English there. In 1897–1902 he was superintendent of naval war records; in 1902–08, head of the department of English and law at the Naval Academy; in latter year retired. He published ‘Twenty Famous Naval Battles: Salamis to Santiago’ (1899).

**RAY, Anna Chapin,** American author of juvenile fiction: b. Westfield, Mass., 3 Jan. 1865. She was graduated at Smith College 1885; received the degree of A.M. in 1888, and removed to Quebec, Canada, in 1903. She published ‘Half a Dozen Boys’ (1890); ‘Half a Dozen Girls’ (1891); ‘In Blue Creek Cañon’ (1892); ‘Dick’ (1896); series of six ‘Teddy’ books (1898–1904); ‘Each Life Unfulfilled’ (1899); ‘Bumper and Baby John’ (1903); ‘The Dominant Strain’ (1903); ‘By the Good Sainte Anne’ (1905); series of six ‘Sidney’ books (1905–10); ‘The Bridge Builders’ (1909); ‘A Woman with a Purpose’ (1911); three ‘Buddie’ books (1911–13), etc.

**RAY, George Washington,** American jurist: b. Otselic, Chenango County, N. Y., 3 Feb. 1844. He was educated at Norwich Academy; served in the Civil War as private and brigade clerk; was admitted to the bar and began practice at Norwich, N. Y., in 1867. He was a representative in Congress in 1883–85 and 1891–92, resigning in the latter year to become United States district judge in the Northern District of New York. He opposed the free silver bill of 1892, was chairman of the committee on invalid pensions and of the committee on judiciary.

**RAY, Isaac,** American physician: b. Beverly, Mass., 16 Jan. 1807; d. Philadelphia, Pa., 31 March 1881. He was graduated from Bowdoin in 1827, practised medicine, and in 1841–45 was superintendent of the State insane asylum at Augusta, Maine. In 1845–66 he had charge of the Butler Hospital for the Insane at Providence, R. I., and then removed to Philadelphia, where he engaged in medical practice. He published ‘Conversations on Animal Anatomy’ (1829); ‘Medical Jurisprudence of Insanity’ (1838); ‘Education in Relation to the Health of the Brain’ (1851); ‘Mental Hygiene’ (1863); ‘Contributions to Mental Pathology’ (1873), etc.

**RAY, John** (at an earlier period spelled by him Wray), English naturalist: b. Black Notley, near Braintree, Essex, 29 Nov. 1627; d. there, 17 Jan. 1705. He was educated at Trinity College, Cambridge, was made Greek lecturer in 1651; mathematical lecturer in 1653; humanity reader in 1655 and junior dean in 1658. He made long botanical and zoological tours in England, Scotland and Wales, and in 1663–66 traveled about Europe with Francis Willoughby in an attempt to accomplish a systematic description of the entire organic world. It is thought that much of the credit bestowed on Ray as the founder of English natural history should properly attach to Willoughby. Ray was elected F.R.S. in 1667. Among his works are ‘Catalogus Plantarum Angliæ’ (1670), the basis of all subsequent English floræ; ‘Methodus Plantarum Nova’ (1682), giving a new system of classification; ‘Historia Plantarum’ (1686–1704); ‘Synopsis Methodica Animalium Quadrupedum et Serpentini Generis’ (1693), and three posthumous volumes on birds, fishes and insects. He also arranged and classified Willoughby's collection of materials for an extensive work on the animal kingdom, published under the titles of ‘Ornithologia’ (1676) and ‘Historia Piscium’ (2 vols. 1686). These volumes noted many species of birds and fishes not observed by previous naturalists. In 1844 The Ray Society was founded at London for the publication of scientific works of established merit. Consult the ‘Memorials’ by Lankester (1844).

**RAY,** a group of elasmobranchs forming the suborder *Batoidei.* The skates and the rays are nearly allied to each other, and are recognized by their broad flattened bodies, which are generally of a rhomboidal shape, and consist in greater part of the enormously developed pectoral or breast fins, which are supported upon a modified portion of the anterior skeleton. On the upper surface of the disc-like body the eyes are borne, together with spiracles or apertures, by which water may be admitted to the gill-sacs. The mouth, nostrils and gill-openings (five on each side) are in the lower surface of the body. The mouth is generally furnished with broad flat teeth of rhomboidal shape, and is of small size. The tail is elongated and slender, and is generally armed with sharp spinous processes. (See Sting-ray). Two or more dorsal fins may exist, whilst the caudal or tail fin is heterocercal. These fishes produce eggs, which, like those of sharks, are enclosed in cartilaginous capsules, known as «mermaids' purses,» etc. Occasionally the rays may attain very large dimensions and weights. They are bottom-fishes, and feed upon other small fishes, crustaceans and mollusks. They swim chiefly by peculiar undulating motions of the edges of the pectoral fins. In the true rays (*Rajidæ*) the snout is more or less pointed and prolonged, and two dorsal fins exist near the end of the tail. The most common members of this group are the sting-rays (q.v.). The European sharp-nosed ray (*R. oxyrhynchus*) is a favorite French food-fish; the homelyn ray (*R. maculata*), also, is frequently sold in the London markets. The American species are called skates (q.v.). The eagle rays (*Myliobatidæ*) possess projecting heads, with the pectoral fins extended laterally in a great degree so as to imitate wings. The teeth are hexagonal, flat and pavement-like. The slender tail possesses one dorsal fin and is armed with a notched spine. These include the California «batfish» (*Myliobatis californicus*), and a famous whip-tailed species of the Mediterranean (*M. aquila*). Allied to these are the huge blanket-rays (*Mantidæ*), so much dreaded by swimmers and divers in all warm seas. Specimens weighing more than 1,000 pounds have been taken in the Mediterranean. (See DEVILFISH). Other families are the sawfishes (*Pristidæ*), the guitarfishes (*Rhinobatidæ*) and the electric rays or torpedoes (*Narcobatidæ*), elsewhere described. See FISHES; ICHTHYOLOGY.

**RAYAHS**, rä'yäz, the Christian peasantry, laborers and small farmers who lived under Turkish rule in the Balkan peninsula. The word means «cattle,» and as cattle these people were treated by their Turkish masters in Bosnia, Servia, Bulgaria and the neighboring states. The term is also applied in Turkey to non-Mohammedan subjects who pay the haratch or capitation tax.

**RAYLEIGH**, rā'lĭ, **John William Strutt**, BARON, O. M., English physicist: b. 12 Nov. 1842; d. 30 June 1919. He was educated at Cambridge, became a Fellow of Trinity College in 1866 and succeeded as 3d Baron Rayleigh in 1873. From 1879 till 1884 he was professor of experimental physics at Cambridge; from 1887 to 1905 was professor of natural philosophy in the Royal Institution; from 1887 till 1896 was secretary to the Royal Society and the latter year scientific adviser to Trinity House. Beside contributions to the proceedings of scientific societies, he contributed the articles «Optics» in the ‹Encyclopædia Britannica› (9th edition) and ‹The Theory of Sound› (1877–78; new ed. 1894–96). He also edited Maxwell's ‹Heat› (1891–94). He was associated with Prof. William Ramsay in the latter's discovery, in July 1894, in atmospheric nitrogen of a new gas, called by them argon, for which in 1904 he was awarded the Nobel prize in physics. He became lord chancellor of Cambridge University in 1908. His work was the most productive in chemical physics, theory of gases, flow of liquids, photography, optics, color vision, wave theory and in electric and magnetic problems of all kinds.

**RAYMOND VI**, rā'mŏnd, count of Toulouse: b. 1156; d. 1222. He succeeded to the territory in 1194. He protected the Albigenses, against whom Pope Innocent III sent an army in 1208 to avenge the assassination of his legate. Raymond's territories were ravaged, he himself twice excommunicated, 1208 and 1211, and his lands given over to Simon de Montfort. After the death of de Montfort at the siege of Toulouse in 1218 Raymond recovered his territories, but again espousing the cause of the Albigenses he was once more excommunicated.

**RAYMOND VII**, son of Raymond VI and last count of Toulouse: b. 1197; d. 1242. He engaged with his father for the recovery of Toulouse from Simon de Montfort, and finally forced the latter's son Amalric to a complete surrender. Forced to make peace with the Pope and King Louis IX of France in 1229, he ceded Narbonne and other territory to France and made Alphonse, Count of Poitiers, brother-in-law of the king and the husband of his only daughter Jeanne, heir to the remainder of his estate.

**RAYMOND, Andrew Van Vranken**, American clergyman: b. Visscher's Ferry, N. Y., 8 Aug. 1854; d. 7 April 1918. He was graduated at Union College 1875, and at the New Brunswick Theological Seminary 1878. He was pastor of the First Reformed Church, Paterson, N. J., 1878–81; Trinity Reformed Church, Plainfield, N. J., 1881–87, and of the Fourth Presbyterian Church, Albany, N. Y., 1887–94; president of Union College, Schenectady, N. Y., 1894–1907, and pastor of the First Presbyterian Church, Buffalo, N. Y., from 1 July 1907.

**RAYMOND, Bradford Paul**, American educator: b. Stamford, Conn., 22 April 1846; d. Middletown, Conn., 27 Feb. 1916. He was graduated from the Theological School of Boston University in 1873, ordained to the Methodist Episcopal ministry in 1874, and studied in Germany in 1880–81. He held successive pastorates in New Bedford, Mass., Providence, R. I., and in Nashua, N. H., was president of Lawrence University, Appleton, Wis., in 1883–89; president of Wesleyan University, Middletown, Conn., in 1889–1908, and professor of ethics and biblical literature there from 1909. He published ‹Christianity and the Christ.›

**RAYMOND, Evelyn Hunt**, American writer of juvenile fiction: b. Watertown, N. Y., 6 Nov. 1843; d. Baltimore, Md., 18 April 1910. She was educated at Mount Holyoke College, and was married to John B. Raymond in 1869. Among her many popular books may be cited ‹Mixed Pickles› (1892); ‹A Cape May Diamond› (1896); ‹Little Red Schoolhouse› (1897); ‹A Daughter of the West› (1899); ‹Reels and Spindles› (1900); ‹The Sun Maid› (1900); ‹A Daughter of the Forest› (1902); ‹Polly the Gringo› (1905); ‹The Heroine of Roseland› (1907); ‹Carlota of the Rancho› (1909), and the ‹Jessica Trent› series (2 vols.), and the ‹Dorothy› series (6 vols., 1907–10).

**RAYMOND, George Lansing**, American educator: b. Chicago, Ill., 3 Sept. 1839. He was graduated from Williams College in 1862 and from Princeton Theological Seminary in 1865. After spending three years in Europe he entered the Presbyterian ministry and was pastor at Darby, Pa., 1870–74; professor of oratory at Williams 1874–80; professor of oratory and æsthetic criticism at Princeton 1880–93, of æsthetics at Princeton 1893–1905, and at George Washington University 1905–12. Among his many published works in verse and prose are ‹Life in Song› (1886); ‹Poetry as a Representative Art› (1886); ‹Ballads of the Revolution› (1887); The Representative Significance of Form› (1900); ‹The Aztec God and Other Dramas› (1900); ‹The Essentials of Æsthetics› (1907); ‹Psychology of Inspiration› (1908); ‹Fundamentals in Education, Art and Civics› (1911); ‹Suggestions for the Spiritual Life› (1912); ‹An Art Philosopher's Cabinet› (1915).

**RAYMOND, Henry Jarvis**, American journalist: b. Lima, N. Y., 24 Jan. 1820; d. New York, 18 June 1869. He was graduated from the University of Vermont in 1840, went to New York, studied law, and contributed to *The New Yorker*, a literary weekly published by Horace Greeley Upon the establishment of the New York *Tribune* in 1841 he became assistant editor. While editorally connected with the *Courier and Enquirer* (1843–51) he engaged with Greeley in a spirited controversy on the subject of Fourierism, which had at that time taken a strong hold upon the American people resulting in the establishment of communities more or less resembling Brook Farm.

He was elected to the State assembly in 1849 and 1850, the latter year becoming speaker. In 1851 he established the New York *Times,* the first number being issued on 18 September. In 1854 he was elected lieutenant-governor of the State. He was one of the prominent organizers of the Republican party, and drew up the «Address to the People,» promulgated by its first national convention held in Pittsburgh February 1856. His choice for President in 1860 was William H. Seward, and he used his influence to place him in the Cabinet after Lincoln's election. After the disaster at Bull Run he proposed a provisional government, feeling that Lincoln's policy was too hesitating. He was again member of the assembly in 1861, where he was chosen speaker; and in 1864 was elected to Congress, giving his support to President Johnson's policy. He was the author of the «Philadelphia Address» to the people of the United States, promulgated by the National Union Convention, which he helped to organize in 1866. He was an effective public speaker and exerted a marked influence on the elevation of the tone of journalism. He wrote ‹Political Lessons of the Revolution› (1854); ‹Letters to Mr. Yancy› (1860); ‹History of the Administration of President Lincoln› (1864); ‹Life and Services of Abraham Lincoln› (1865). Consult Maverick, ‹Henry J. Raymond and the New York Press for Thirty Years› (1870).

**RAYMOND, John Howard,** American educator: b. New York, 7 March 1814; d. Poughkeepsie, 14 Aug. 1878. He was graduated at Union College in 1832; studied law in New Haven; entered the theological seminary at Hamilton, N. Y., in preparation for the Baptist ministry in 1834; was appointed tutor in Hebrew before graduation; became professor of rhetoric and English literature at Madison University in 1839, and removed to the newly established Rochester University as professor of belles-lettres in 1850. As an organizer of educational institutions he showed remarkable aptitude, performing that service for the Collegiate and Polytechnique Institute in Brooklyn in 1856 and for Vassar College in 1865. He filled the post of president and professor of mental and moral science at Vassar until his death. Consult his ‹Life and Letters› (1880).

**RAYMOND, John T.,** American actor: b. Buffalo, N. Y., 5 April 1836; d. Evansville, Ind., 10 April 1887. His original name was John O'Brien. His first appearance was at Rochester in June 1853, as Lopez in ‹The Honeymoon.› In 1861 he made a great hit as Asa Trenchard in ‹Our American Cousin,› and in 1867 went to England and appeared in this character in the company of E. A. Sothern, who was the famous Lord Dundreary. In 1874 he achieved his greatest success as Colonel Mulberry Sellers in a dramatization of Mark Twain's ‹Gilded Age.› He was widely popular and depicted certain types of broad, humorous character with great success.

**RAYMOND, Miner,** American Methodist Episcopal clergyman: b. New York, 29 Aug. 1811; d. Evanston, Ill., 25 Nov. 1897. He was graduated at Wesleyan Academy, Wilbraham, Mass., in 1831, and was a member of the faculty there in 1831–41. After holding pastorates at Worcester, Boston and Westfield he returned to Wesleyan Academy and was its principal in 1848–64. He became professor of systematic theology at Garrett Biblical Institute, Northwestern University, Evanston, Ill., in 1864 and remained in that position 30 years. Author of ‹Systematic Theology› (3 vols., 1877).

**RAYMOND, Rossiter Worthington,** American mining engineer: b. Cincinnati, Ohio, 27 April 1840; d. Brooklyn, N. Y., 31 Dec. 1918. He was graduated from the Brooklyn Polytechnic Institute in 1858 and spent three years in study at Freiburg, Munich and Heidelberg. Returning from Europe he entered the Union army and served from 1861 to 1864 as additional aide-de-camp with the rank of captain. From 1864 to 1868 he was consulting engineer in New York, at the end of which time he was appointed United States commissioner of mining statistics and held this post until 1876. From 1870 to 1882 he was lecturer on economic geology at Lafayette College. In 1885–88 he was New York State commissioner of electric subways for the city of Brooklyn. One of the original members of the American Institute of Mining Engineers, he became its vice-president in 1871, was its president 1872–74, secretary 1884–1911, and secretary emeritus from 1911. He was a member of scientific and technical societies in Europe and America, including the Society of Civil Engineers of France. In 1903 he became lecturer on mining law in Columbia University. He published ‹Reports on the Mineral Resources West of the Rocky Mountains› (1869–76); ‹The United States Mining Industry›; ‹Mines, Mills and Furnaces›; ‹Silver and Gold›; ‹Brave Hearts,› a novel (1873); ‹The Man in the Moon and Other People› (1874); ‹The Book of Job› (1878); ‹Camp and Cabin› (1880); ‹A Glossary of Mining and Metallurgical Terms› (1881); ‹Memorial of Alexander L. Holly› (1883); ‹Life of Peter Cooper› (1901); also technical works and papers, especially on mining law.

**RAYMOND, Walter,** English novelist: b. Yeovil, Somerset, 13 March 1852. He was educated at private schools, and was partner in a glove manufactory, but in 1895 gave up business for literature. Among his works, several of which appeared under the pseudonym «Tom Cobbleigh» are ‹Misterton's Mistake› (1890); ‹Gentleman Upcott's Daughter› (1894); ‹Love and Quiet Life› (1894); ‹Tryphena in Love› (1895); ‹Two Men o' Mendip› (1898); ‹The Idler Out of Doors› (1901); ‹Jacob and John› (1905); ‹The Book of Simple Delights› (1906); ‹Tales from Gossip-Corner› (1907).

**RAYMOND, William Galt,** American civil engineer: b. Princeton, Iowa, 2 March 1859. He was graduated at Washington University as a civil engineer in 1884; was instructor of civil engineering at the California State University 1884–90; was professor of geodesy, road engineering and topographical drawing at the Rensselaer Polytechnic Institute 1892–1904, and since 1904 professor of civil engineering and director of the School of Applied Sciences at Iowa State University. He published ‹Plane Surveying› (1896); ‹Elements of Railroad Engineering› (1908); ‹Railroad Field Geometry› (1910); ‹Railroad Field Manual for Civil Engineers› (1915).

**RAYMOND, Battle of.** After the battle of Port Gibson (q.v.), 1 May 1863, the Confederates fell back beyond the Bayou Pierre and destroyed the bridges. General Grant followed on the 2d, occupied Port Gibson, and the same evening the Confederates continued their retreat across Big Black River, at Hankinson's Ferry, leaving a force behind to prevent the crossing, which was attacked on the morning of the 3d by Crocker's division of McPherson's corps. The Confederates stoutly contested the ground, retiring very slowly, until late in the day, when Logan's division came upon their flank, when they hastily crossed the river. McPherson's corps was moved forward to Hankinson's Ferry and McClernand's to Willow Springs, where they remained until the 7th, when, Sherman's corps having crossed the Mississippi, the advance was resumed. the main body of the army moving along the line of the Big Black toward Edwards' Station, midway between Vicksburg and Jackson, while McPherson, on the right, was directed upon Jackson, the capital of the State, 45 miles east of Vicksburg, and the geographical and railway centre of the State. On the night of the 11th McPherson bivouacked five miles northeast of Utica, on the road to Raymond, and early in the morning pushed rapidly for Raymond, 18 miles from Jackson, hoping to capture some commissary stores, but before 9 A.M. Logan's division, in the advance, encountered a strong body of the enemy, upon which the division was deployed and continued its advance for two hours, when, coming to a small stream crossing the road about two miles from Raymond, General Gregg's brigade of about 3,000 men, with two batteries, was seen beyond the stream, disposed to enfilade the road and bridge over the stream. Logan threw out skirmishers and advanced, bringing on a severe engagement which continued more than two hours, when the leading brigade of Crocker's division came up to his support, upon which Gregg, leaving two disabled guns, abandoned the field and retreated toward Jackson, being joined on the way by Walker's brigade, and when overtaken by night, bivouacking five miles from the field. The Union loss was 66 killed, 339 wounded and 37 missing. Gregg reported a loss of 73 killed, 229 wounded and 204 missing. Consult 'Official Records,' Vol. XXIV; Grant, 'Personal Memoirs,' Vol. II.

E. A. CARMAN.

**RAYNAUD'S** (rā-nōz') **DISEASE,** a vasomotor affection, occurring mostly in children and young adults, and characterized by coldness and whiteness of the toes, the tips of the fingers, the end of the nose and sometimes of the lobes of the ears. It may exist with other functional nervous disorders, such as hysteria and neuralgia, and occurs especially in persons of neurotic heredity or temperament. It was first studied by Raynaud in 1862. He believed that the local manifestations are due to constrictor spasm, probably originating in the gray centres of the spinal cord. No central lesions have been found. After exposure to cold, the toes, fingers, nose, etc., become cold, numb and white (local syncope), and pricking draws no blood. When warmth and color return, there is frequently pain, also congestion, swelling and a purple color (local asphyxia). Either of these stages may be recovered from, or the second stage may end in gangrene of the parts (Raynaud's gangrene, local or symmetrical gangrene). Recurrences of the disease are common. The prognosis is not good, especially in debilitated children. For treatment avoid cold, use warm baths, electricity and massage. Ichthyol ointment sometimes alleviates the pain. Other remedies should be advised by the physician.

**RAYNER,** rā'ner, **Emma,** American novelist: b. Cambridge, England. She was graduated from Cambridge University in 1888, came to this country and was employed on the staff of the *Youth's Companion* in 1896–1902. She published 'Free to Serve' (1897); 'In Castle and Colony' (1899); 'Visiting the Sin' (1900); 'Doris Kingsley: Child and Colonist' (1901); 'Handicapped Among the Free' (1903); 'The Dilemma of Engeltie' (1911).

**RAYNER, Isidor,** American lawyer and politician: b. Baltimore, Md., 11 April 1850; d. Washington, D. C., 25 Nov. 1912. He received his education at the University of Virginia, and entering on the practice of law in 1870, soon became one of the leaders of the Baltimore bar. In 1878 he was elected to the State legislature for two years, in 1885 was chosen a State senator for four years, but resigned in the middle of his term to become the Democratic candidate for Congress, in which he served in 1887–89 and 1891–95. In 1899–1903 he was attorney-general of Maryland, and from 1905 till his death, United States Senator. In early youth he practised declamation and became an effective speaker.

**RAYNOUARD,** rā-noo-är, **François Juste Marie,** French poet and philologist: b. Brignoles, department of Var, 18 Sept. 1761; d. Passy, 27 Oct. 1836. He studied for the bar at Aix and practised law at Draguignan with great success. Elected a deputy to the legislative assembly in 1791, he attached himself to the Girondins, and on the proscription of that party was thrown into prison. The fall of Robespierre set him at liberty, whereupon he resumed his profession of advocate in his native province and acquired a fortune. Having previously made two unsuccessful attempts to live by his pen, he once more settled in Paris. His poems 'La vertu nécessaire dans les républiques' (1803) and 'Socrate dans le Temple d'Aglaure' (1804), obtained prizes from the French Academy. These were followed by two tragedies, 'Eléonore de Bavière' and 'Les Templiers,' the latter performed at the Théâtre Français in 1805 by order of Napoleon. In 1806 he was elected a member of the Corps Législatif. In 1817 he was nominated perpetual secretary of the Academy, a post he resigned in 1826, when the ministry presented to the chambers a bill which had for its object the limiting of the liberty of the press. Of most value to the world is the work in the field of Romance philology, his writings including 'Grammaire comparée des Langues de l'Europe Latine dans leurs Rapports avec la Langue des Troubadours' (1821); 'Choix des Poésies originales des Troubadours' (1816–21); 'Lexique Roman ou Dictionnaire de la Langue des Troubadours comparée aux autres Langues de l'Europe Latine' (posthumous, 1838–44); 'Observations Philologiques sur le Roman de Rou, et sur quelques Règles de la Langue des Trouvères au XIIe Siècle' (1829).

**RAZIN**, rä'zēn, **Stenko**, Russian bandit: d. Moscow, 1671. He was the leader of Cossacks who plundered caravans and fisheries along the Volga. Being captured he was pardoned by Alexis, but rebelled again, and gathered about himself the dissatisfied elements, captured cities and ruled along the Volga as far as Nijni-Novgorod. He was finally taken and executed at Moscow. Thereupon he became the hero of epic song of the 17th century and was regarded as the champion of the people against the nobles.

**RAZOR**, the well-known keen-edged instrument for shaving off the beard or hair. Razors seem to have been in use at a very early period of the world's history. They were used by the ancient Egyptians. The Levitical code expressly forbade the shaving of the beard, and many Jews in some countries remove all superfluous hair with the scissors until this day. It is believed by many authorities that the primitive shaving-instruments were made of sharpened flints; the savages of Polynesia still use two pieces of flint of the same size, or pieces of shells or sharks' teeth ground to a fine edge, for this purpose. Among civilized nations the blade is metal, usually steel, the finest cast steel being preferred. The handles are made of a great variety of materials, as silver, ivory, tortoise-shell, bone, horn, etc. The Chinese and Japanese razors are very rarely furnished with handles. In the United States a modern form, known as a «safety» razor, has become widely popular.

**RAZOR-BILL**, the *Alca torda*, the sole species of the genus, the *Alca impennis*, or great auk, being extinct. It is intermediate in structure between the guillemots and the great auk; but characterized by its compressed, elevated, hooked and furrowed bill, its peculiar stiff wedge-shaped tail and ample wings. It is about 18 inches long, generally black above and white below; but in the breeding plumage the head and neck become lustrous black all around, with a very characteristic fine white line running from the eye to the base of the bill. This bird is abundant in the North Atlantic, frequenting rocky islands and coasts to breed with puffins and guillemots, but at other seasons keeping farther out at sea, and in winter migrating as far south as the Mediterranean and the coast of New Jersey or even North Carolina. On the American side it breeds in the Bay of Fundy and in great colonies in the Gulf of Saint Lawrence, about Labrador, etc. A single much blotched and streaked whitish egg, about three inches long, is deposited on a ledge or in a fissure of some precipitous rocky cliff. It feeds upon floating refuse or fish, worms, etc., for which it dives or which it pursues in the water, using both wings and feet in swimming. When molested it sometimes fights viciously, at the same time uttering harsh cries. The large eggs are much gathered for food. It is also known as the black-billed auk, the murre, and the tinker.

**RAZOR-CLAM**, or **RAZOR-FISH**, a bivalve mollusk of the family *Solenidæ*, known on all sandy shores. The shell is long and narrow, like a razor-handle, and gapes at both ends, the siphons are short, the foot is large and powerful. The shell is handsomely ornamented and in some tropical species is of great beauty. These mollusks always live buried in the sand in an upright position, leaving only an opening shaped like a keyhole, which corresponds with the two siphon tubes. They are generally found at a depth of one or two feet, and when they make their burrows, as they are often in the habit of doing, among the rocks, not even an iron hook can draw them from their retreat, but they may sometimees be beguiled by pouring salt water on the spot, deceiving them into the impression that the tide has risen and they may begin to feed. They are edible, but rather tough. A familiar and typical species on the eastern coast of the United States is *Ensis americana*. Consult Kingsley, 'Standard Natural History' (Vol. I, 1885).

**RAZORBACK**, one of the large whales of the genus *Balænoptera*, called also finbacks and rorquals. (See FINBACK; WHALE). The *B. musculus*, the common rorqual or razorback, is 60 to 70 feet long, black above and brilliant white below. The *B. rostrata*, or lesser rorqual, resembles the other, but is much smaller. The rorquals are widely distributed and some of them are found in almost every sea. Razorback is also a name for the thin and agile semi-wild hogs which range the woods in the less settled parts of the southern United States.

**RE**, rā, the sun god, first and most important of Egyptian divinities. Re is supposed to be the son of Neith (q.v.), the goddess of the upper air, and to have had for his wife Mout, the mother of nature. He had for children Athor, the light; Mu, the sunlight; and Mat, spiritual light, and was widely worshipped by the ancient Egyptians, and in course of time every local divinity became identified with Re; thus, Ammon became Ammon-Re; Sobk changed to Sobk-Re. The attempt to unify the personages of mythology under Re and thus erect a monotheism is credited to Amenophis IV of the 18th dynasty. Re is represented, like Horus, with the head of a hawk and bearing the disc of the sun on his head, and was more extensively worshipped than any other Egyptian deity except Osiris.

**RÉ**, rā, or **RHÉ**, **Île de**, France, a small low-lying island three miles distant from the coast of the department of Charente-Inférieure, opposite the city of La Rochelle, from which it is separated by the Pertuis Breton. It is about 18 miles long and three broad and measures 28 square miles. The inhabitants are chiefly engaged in the preparation of salt, producing 32,000 tons annually. The west coast is rocky; on the east side there are some good harbors. Oyster farming has become an important branch of industry, yielding 35,000,000 annually. Wine is made and exported. The chief town, Saint Martin, was fortified by Vauban. Pop. of island about 15,000.

**REA**, rā, **Samuel**, American railroad president and engineer: b. Hollidaysburg, Pa., 21 Sept. 1855. He entered the engineering department of the Pennsylvania Railroad when 15 years of age, becoming locating and construction engineer on various branches of the road. He was afterward connected with the Pittsburgh and Lake Erie Railroad, and was chief engineer in the construction of the belt line and tunnel under Baltimore for the Baltimore and Ohio Railroad. He returned to the Pennsylvania

Railroad in 1892 and became its president in 1913. He was in charge of the construction of the New York tunnel extension and the station of the Pennsylvania Railroad in New York, for which the University of Pennsylvania conferred upon him the degree of Sc.D. in 1910. He was appointed a member of the executive committee of the special commission on national defense in the United States Railroad Administration in 1917. Author of 'The Railways Terminating in London' (1888).

**REACTION,** *in chemistry,* a general term for any chemical change that is brought about by the mutual interaction of two or more substances. Reactions between two primary substances may be conveniently divided into three classes, as follows: (1) Those in which the two substances combine additively, so as to form a single third substance by their union. (2) Those in which one of the primary substances is broken up, the other primary substance combining additively with one or all of its parts, so as to produce one or more new substances. (3) Those in which there is a double decomposition of the two primary substances, the several parts of the first combining with those of the second so as to produce two or more new substances. The first of these is illustrated by the action of oxygen gas upon metallic sodium, the combination taking place additively according to the equation $2Na + O = Na_2O$. The second is illustrated by the action of chlorine gas upon an excess of methane ($CH_4$); methyl chloride and hydrochloric acid being formed (upon exposure to diffuse daylight) in accordance with the equation $CH_4 + 2Cl = CH_3Cl + HCl$. The third general type of reaction between two primary substances (that, namely, in which there is a double decomposition) may be illustrated by the action of hydrochloric acid upon caustic potash, KOH, as indicated by the equation $KOH + HCl = H_2O + KCl$, the products of the reaction being water and chloride of potassium.

Reactions take place with widely varying degrees of intensity. This intensity is known in chemistry as «affinity,» and is evidenced by an exhibition of great heat, violent ebullition, explosion and like physical manifestations. These phases are more noticeable when the two combining substances are of different «electricities,» that is, one positive and the other negative. Temperature has a decided effect upon the velocity with which chemical reactions take place, and many reactions may be restrained by cold. On the other hand, after a reaction has taken place a sufficient rise in temperature may decompose the new compound into its primary constituents.

In all reactions it is observed that substances combine in certain definite proportions, and these are called their «combining weights,» or «constant proportions.» The law which is found to obtain in all cases is that the elements combine in the ratios of their combining weights, or in simple multiples of such ratios — the term «combining weight» standing for the smallest relative mass of the element (that is, the smallest number of atoms) in which the element enters into combination with other elements. Thus, 110.34 parts of potassium bromide are required to supply the exact amount of bromine to convert 100 parts of silver into silver bromide. Conversely, 100 parts of silver combined with chlorine will form 132.845 parts of silver chloride — no more and no less, though a much greater quantity of chlorine may be present.

The subject of chemical reaction is intimately connected with the entire question of chemical constitution, of which much remains to be learned. See the article Chemistry; also Catalysis; Chemical Affinity; Equilibrium, Chemical; Periodic Law; Valency.

**REACTION TIME.** One of the cardinal problems of psychophysics is the measurement of the duration of mental processes. The mental processes themselves are always inaccessible to direct temporal measurement, but certain physiological-psychological complexes are easily available. These consist in the entire aggregate of phenomena which occur between the reception of some stimulus and the conscious, voluntary response to the stimulus. The duration of the aggregate is known as the reaction of time and is measured by various types of chronoscope (q.v.). A simple reaction times is one where the response follows directly upon the stimulation. The length of a simple reaction depends on the sense and mode of reaction employed, and on whether the attention is directed toward the stimulus or the reaction. The following table gives an idea of the order of magnitude of reaction times:

| | Attention towards stimulus. | Attention toward reaction. |
|---|---|---|
| Reaction to light | .270 seconds | .180 seconds |
| Reaction to sound | .225 seconds | .120 seconds |
| Reaction to preasure | .210 seconds | .110 seconds |

Besides these simple reactions, reaction experiments may be performed which demand a recognition or a discrimination before the subject can press the reaction key. These experiments will require .03 to .05 seconds more than a simple reaction experiment of the same sort with the attention directed toward the stimulus. It may be thought that this is the actual time of the process of recognition. This interpretation is dependent on interpreting the reaction as an ordinary sensory reaction interrupted by an act of discrimination or cognition. This is in all probability an over-simplification of the facts. Reaction-experiments have also been used to determine the duration of an act of choice and of various types of association. In this latter connection they have been used by some investigators to determine the mental content of a subject who is concealing something. Consult James, W., 'Principles of Psychology' (New York 1890); Külpe, 'Outlines of Psychology' (trans. London 1895); Pilzecker, A., 'Die Lehre von der sinnlichen Aufmerksamkeit' (1889); Titchener, 'Experimental Psychology' (New York 1905); 'Text-book of Psychology' (New York 1909–11); Wundt, 'Grundzuge der physiologischen Psychologie' (6th ed., Leipzig 1908–11).

**REACTIONS AND REACTION TIMES IN PSYCHOLOGY.** Owing to the large place occupied by movement in man's life and the practical importance of knowing the time required in movements in making records in physics and astronomy, much labor has been spent by the psychologist and physiologist in measuring the time used in making different reactions. The first interest in the topic was aroused when it was found that different men recorded the time at which a star crossed a wire in the telescope differently. Experiment showed that this was in part due to the variation in the time needed to make the recording movement. Later experiments were devoted to measuring the times of other mental processes that were involved in more complex mental and physical operations, with the object of explaining movement in general. All measurements involve determining the time that elapses between some stimulus and a prescribed movement. The times are recorded electrically. The apparatus most frequently employed is a Hipp chronoscope with instruments for giving stimuli and keys to make or break circuits as the movement is completed. The Hipp chronoscope is a clock controlled by the vibration of a fork or metallic tongue which vibrates 1,000 times per second. The hands are so adjusted that an electric magnet will articulate them with the clock work. As the stimulus is shown a circuit is made through the clock which engages the hands in the gears, and they continue to revolve until the movement breaks the circuit. One reads the time elapsed in thousandths of a second (ordinarily designated $\sigma$). One distinguishes simple and compound reactions. The simple are made as quickly as possible after the stimulus, the compound are delayed until some mental operation is introduced. The simple reaction varies in length with the individual and with the mental attitude. If one attends to the movement alone the response is quicker than if one attends to the stimulus and makes sure that one knows what it is before one acts. The latter or sensory times for auditory stimuli range from 180$\sigma$ to 220$\sigma$; for visual stimuli from 200$\sigma$ to 290$\sigma$, and for tactual stimuli are about 210$\sigma$. The muscular reactions require about 100$\sigma$ less. It was at first asserted that they were always less by this amount, but in most of the more recent experiments the difference has been smaller and has varied for individuals. Sound stimuli involve times of 110–125$\sigma$; light, 170–180$\sigma$, and tactual, 105–110$\sigma$. The mean variation for the muscular reaction is smaller — from 6–9$\sigma$, as compared with 24–28$\sigma$ for the sensory, and premature reactions are more frequent. The time required for any movement may be analyzed into four parts: the time required to stimulate the sense organ, the time of transmission along the nerve fibre, the time involved in passing from one nerve element to another and the time needed to excite the contraction in the muscle. The more important variables are the time required in the sense organ and the time for passing from one neurone to another. The greater length of the visual reaction is due to the longer time required to excite the retina, a photochemical process. The fact that reactions are shortened by training and by the attitude or preparation is a result of reducing the time needed to pass from one nerve element to another. The very short time of the reflex winking on stimulation of cornea (as little as 35$\sigma$) is probably explained by its having a path in the subcortical tracts with relatively few elements to pass over. The simplest of the compound reactions is the discrimination reaction. In this the reactor is asked to discriminate between two or more stimuli before he responds. The time required increases with the number of objects or qualities between which discrimination must be made. Distinguishing between two qualities adds 20–30 to the sensory time, and when one must distinguish between 10, the time may be increased by 500$\sigma$ or more. In the choice reaction, the reactor must make a different movement for each of the qualities. He may, e.g., react with the right hand to red and with the left to white, or he may be shown one of 10 colors and react with a different finger or thumb to each. The times for the choice reaction vary greatly with the individual and the amount of practice as well as with the complexity of the response demanded. They add to the discrimination time from 60–80$\sigma$ when one of two movements may be chosen to 400$\sigma$ or more when 10 movements are possible. In addition to these motor processes and processes essential to movement, measurements have been made of association times and the times involved in other more complicated mental processes. Association times are usually investigated by showing the observer a word and asking him to give some other word as quickly as possible. To think this word takes from 400$\sigma$ to two seconds or more longer than it does to read a word. This time varies greatly with the individual and also with the conditions prescribed for the association. When one is left free to give any word whatever, one uses more time than when one is restricted in some way. Thus, when two numbers over each other are shown and one has been told in advance that one may either add, subtract or multiply, the response is more delayed than when one is told to add. In general, the smaller the number of possible associates the shorter the time. To name a member of the class when a class is given takes longer than to name the class when one member is shown. It might be noted that the association time is increased when the word arouses an emotion. This fact has been used by Jung as an aid in the detection of emotional complexes that may be responsible for hysteria. In explaining all responses and attempting to allot portions of the time to different acts, we must recognize that preparation of the act begins with the instructions. We may divide the process into two parts, the fore period from the time of receiving the instructions until the stimulus is given and the time between the stimulus and responses. During the fore period there is apparently a process of partially arousing the possible paths of discharge, and all that is necessary after the stimulus presents itself is to select the appropriate response from those that are already prepared. This «determining tendency» acts with the stimulus in deciding both the form of association and the nature of the response. This fact, that instruction and stimulus unite in determining the act, makes it impossible to divide the compound reaction into a number of part processes each distinct from the other. One does not see first, then discriminate, then choose and finally react, but the various processes overlap. Much of the choice is made before the stimulus is shown and the way for the association begins to be prepared when the instructions are heard. Studies of these conditions are valuable, for the explanation of action in general as well as for understanding the nature of reaction times. Consult Titchener, 'Text-book of Psychology' (pp. 428–447); Ladd-Woodworth, 'Elements of Physiological Psychology› (pp. 476–499); Myers, ‹Text-book of Experimental Psychology› (ch. XI); Ach, ‹Die Willenstatigkeit und das Denker›; Alliotta, ‹La misura in psicologia experimentali.›

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**READ,** rēd, **George,** American patriot and jurist, one of the signers of the Declaration of Independence: b. Cecil County, Md., 18 Sept. 1733; d. New Castle, Del., 21 Sept. 1798. He was educated at Chester, Pa., studied law and was admitted to the bar in Philadelphia, soon afterward settling in New Castle, Del., where he practised his profession. He served as attorney-general for the Crown for the counties of Delaware, Kent and Sussex from 1763 to 1764, when he was elected a member of the first Continental Congress. Early an opponent of independence, at last he saw no alternative, and signed the petition to George III, the Declaration itself and later the Federal Constitution, the three fundamental documents of the American government. He was chairman (1775–77) of the first naval committee of the colonies, and is to be considered as one of the chief founders of the primitive American navy. The new constitution of Delaware (1776) was drafted by him and he was president of the convention which adopted it. He was made vice-president and acting president (governor) of the State of Delaware, whose laws he codified. In 1782 he was appointed judge of the United States Court of Appeals for Admiralty Cases. He was a delegate to the Annapolis Convention (1786) and to the Constitutional Convention (1787), and was elected to the United States Senate in 1789 and in 1791. Resigning in 1793, he became chief justice of Delaware and held that office during the rest of his life. Consult his ‹Life and Correspondence› (1870).

**READ, John Elliot,** American journalist: b. South Amherst, Mass., 4 Jan. 1845. He was educated in the public schools and wrote much for agricultural, religious and literary periodicals. He was associate editor of *The Working Farmer* in New York 10 years, and corresponding editor of *The Practical Farmer,* Philadelphia, for 12 years, and on the editorial staff of ‹Men of Mark in America› in 1903–09. He published ‹Farming for Profit› (1880); ‹Life Triumphant: A study of the Nature, Origin and Destiny of Man› (1900); also wrote ‹A Brief History of the Principal Earlier Arctic Explorations from the 9th Century to the Peary Expedition› as the concluding section of ‹Nansen in the Frozen World› (1897). In 1910 he became connected with the *Gazette,* Schenectady, N. Y., and the *Knickerbocker-Press,* Albany, N. Y.

**READ, John Joseph,** American naval officer: b. Mount Holly, N. J., 17 June 1842; d. 24 Oct. 1910. He was graduated from the United States Naval Academy, 1861, served under Farragut during the Civil War, and on the Atlantic blockades, and in 1866 was promoted lieutenant-commander. He received steady advancement, was made rear-admiral in 1900 with command of the receiving-ship *Richmond,* in 1901 was placed in command of the navy yard at Portsmouth, N. H., and in 1904 was retired.

**READ, John Meredith,** American jurist: b. Philadelphia, Pa., 21 July 1797; d. there, 29 Nov. 1874. He was a son of George Read, signer of the Declaration of Independence, was graduated at the University of Pennsylvania in 1812 and admitted to the bar in 1818. In 1822–23 he occupied a seat in his State's legislature, and later as city solicitor drew up the first statement of the finances of Philadelphia. He was United States attorney for the eastern district of Pennsylvania in 1837–44, and served as solicitor-general of the United States; attorney-general of Pennsylvania and chief justice of that State from 1860 until his death. In 1845 he was nominated for associate justice of the United States Supreme Court, but his confirmation was opposed in the United States Senate because he had been a founder of the free-soil wing of the Democratic party, and he withdrew his name. With the formation of the Republican party he became one of its members, and by it was elected judge of the Supreme Court of Pennsylvania in 1858. His name was proposed as a candidate for the presidency of the United States in 1860 and several votes were actually cast for him in the Chicago convention, though he used his personal influence in favor of Abraham Lincoln. His ‹Views on the Suspension of the Habeas Corpus› (1863) became the basis of the act of 3 March 1863, authorizing the President to suspend the habeas corpus act. His legal opinions extend through 41 volumes of reports, while of his published addresses the principal are ‹Plan for the Administration of the Girard Trust› (1833); ‹The Law of Evidence› (1864); ‹Jefferson Davis and his Complicity in the Assassination of Abraham Lincoln› (1866).

**READ, John Meredith,** American diplomatist: b. Philadelphia, Pa., 21 Feb. 1837; d. Paris, 27 Dec. 1896. He was a son of Judge Meredith Read (q.v.), was graduated at Brown University in 1858, and at the Albany Law School in 1859. He pursued the study of international law in Europe, was admitted to the bar in Philadelphia and settled at Albany. From 1860 to 1866 he was adjutant-general of the State of New York. In 1869 he was appointed United States consul-general at Paris, and during the period of the Franco-Prussian War he acted there also as consul-general for the German government, for which he received the thanks of both the French and German governments, and personal recognition of his services from Prince Bismarck. From 1873 to 1879 he was United States Minister to Greece, and during the latter part of his tenure of office personally paid the expenses of the legation, when the government refused the appropriation, he believing that the time was too critical to close the mission. His important services during his term were his securing the revocation by the Greek government of an order prohibiting the sale of the Bible in Greece; the release of the American ship *Armenia,* and the report of an open Russian port during the Turkish War, to which he urged the despatch of a grain fleet. After his relinquishment of diplomatic duties he continued to reside in Europe, engaged in archæological, historical and art studies. He was the author of a ‹Historical Inquiry Concerning Henry Hudson› (1866).

**READ, Nathan,** American inventor: b. Warren, Worcester County, Mass., 2 July 1759; d. near Belfast, Maine, 20 Jan. 1849. He was graduated from Harvard in 1781; studied medicine; in 1796 established with others the Salem iron foundry, where chain cables and other iron work for ships were manufactured, and in 1798 patented a nail-making machine. In 1788 he became interested in steam navigation, and as his first task attempted the construction of a boiler that should be at once compact, light and safe. He made, in 1788 or 1789, the first drawings of what he styled his «portable furnace boiler,» which was devised for use on steam carriages and steamboats, and for which he obtained a patent 26 Aug. 1791. He had built a steamboat in 1789, and by a trial of this craft, which was fitted with paddle-wheels and a crank operated by hand, was satisfied that his method of applying steam to the propulsion of vessels would work suitably. This steamboat is said to have been substantially identical with that of Fulton's of 1807, and it is further stated that he withdrew his application for a patent in 1790, under a misapprehension. There is no evidence, however, that he succeeded in even an experimental demonstration of his plans. His model steam carriage, exhibited by him while endeavoring to obtain aid in his schemes, was never developed. He did, however, invent the vertical multi-tubular firebox boiler, which has long been in use as a standard form. Among his other inventions were several forms of pumping engines, and a plan for utilizing the force of the tide by means of reservoirs alternately so filled and emptied as to produce a continuous stream of water. Much credit belongs to Read for his early and clear perception of the importance of steam navigation. From 1800 to 1803 he was a Federalist representative in Congress, and after his removal to Maine was for many years chief justice of the Court of Common Pleas of Hancock County. Consult Read, ‹Nation Read› (1870); Thurston, ‹A History of the Growth of the Steam Engine› (1878).

**READ, Opie Percival,** American journalist and novelist: b. Nashville, Tenn., 22 Dec. 1852. He was educated in Gallatin, Tenn.; entered journalism at Franklin, Ky., and later removed to Little Rock, Ark. He edited the Arkansas *Gazette* in 1878–81; founded the *Arkansaw Traveler* in 1883, and edited it for eight years, and then removed to Chicago, where he devoted himself to literary work. His publications include ‹Len Gansett› (1888); ‹Up Terrapin River› (1889); ‹A Kentucky Colonel› (1890); ‹My Young Master› (1896); ‹In the Alamo› (1900); ‹Our Josephine› (1902); ‹An American in New York› (1905); ‹The Mystery of Margaret› (1907), etc.

**READ, Thomas Buchanan,** American poet and painter: b. Chester County, Pa., 12 March 1822; d. New York, 11 May 1872. His father was a farmer and he received but little schooling. He lived at various times during his youth and young manhood at Philadelphia, Cincinnati, New York and Boston, occupied in ways that satisfied his tastes, such as portrait painting and writing verses, when he could; and in other ways that supplied his necessities, such as sign painting, cigar making, play acting, when he must. He published his first verses in the Boston *Courier* in 1843–44; later a Revolutionary tale ‹Paul Redding› (1845) and ‹Poems› (1846), before his removal to Philadelphia, where he edited ‹The Female Poets of America› (1848), and brought out his ‹Lays and Ballads› (1849). In 1850 he went to Europe and joined the circle of American artists living at Rome. Here he had the first opportunity for the serious study of painting, and for the rest of his life, save for occasional visits to America, he made his home at Rome. His better known paintings are ‹The Water Sprite›; ‹The Lost Pleiad›; ‹The Star of Bethlehem›; ‹Sheridan and his Horse.› He made portraits of Mrs. Browning, the ex-Queen of Naples, Henry W. Longfellow and a group of Longfellow's children. His portrait of George Peabody is at the Institute in Baltimore. A sculptured bust of General Sheridan was executed late in life. It is as a poet, however, that he will be remembered, especially by his stirring ‹Sheridan's Ride,› written for the elocutionist and actor, James E. Murdock, and the exquisitely musical lyric ‹Drifting.› His volumes of verse are ‹The New Pastoral› (1855); ‹Sylvia or the Last Shepherd› (1857); ‹The Wagoner of the Alleghanies,› in which occurs the fine lyric ‹The Maid Who Binds Her Warrior's Sash› (1862). A complete edition of his poems was published in 1882.

**READE,** rēd, **Charles,** English novelist and play-writer: b. Ipsden House, Oxfordshire, 8 June 1814; d. Shepherd's Bush, London, 11 April 1884. He was graduated at Oxford in 1835, at which he obtained a fellowship, and was called to the bar in 1843, but, finding literature more attractive than law, devoted himself to the former and never practised. He became first known by a comedy (in conjunction with Tom Taylor) called ‹Masks and Faces,› which he presently elaborated as the novel of ‹Peg Woffington› (1852). This was followed by ‹Christie Johnstone› (1853), in which he showed considerable appreciation of certain characteristics of Scottish life. The appearance, in 1856, of ‹Never Too Late to Mend,› one of his «novels with a purpose,» in which he attacked the English prison system with perhaps greater zeal than unbiased judgment, secured for him a wide reputation. His next great work, the most scholarly and artistic of his writings, ‹The Cloister and the Hearth,› dealing with the lives of the parents of Erasmus, appeared in 1861, is decidedly his masterpiece, and has been described by Besant as the greatest historical novel in the language; but it has not attained the popularity, with the general reader, of some of his more melodramatic novels. Among the more important of his other works are ‹Love Me Little, Love Me Long› (1859); ‹Hard Cash› (1863); ‹Griffith Gaunt› (1866); ‹Foul Play› (with Dion Boucicault, 1869); ‹Put Yourself in His Place› (1870); ‹A Terrible Temptation› (1871); ‹The Wandering Heir› (1872); ‹A Perilous Secret› (1884). He was also the author, either alone or in collaboration with others, of several dramas, including ‹Gold›; ‹Two Loves and a Life›; ‹The King's Rivals›; and ‹Drink,› the last adapted from Zola's ‹L'Assommoir.› None of these won much success for Reade. His ‹Courier of Lyons,› renamed ‹The Lyons Mail,› has been made famous by Sir Henry

Irving in the dual rôle of Lesurques and Dubosc. Reade was enthusiastic by nature, and continually filled with new enthusiasms toward any cause which roused his easily excited interest. The abuses in the convict prison system produced, as was said, one of his best-known novels; the system of private lunatic asylums furnished the motive for ‹Hard Cash,› as the trades-union outrages at Sheffield did for ‹Put Yourself in His Place,› while in ‹Foul Play› he attacked the alleged practice of overloading and over-insuring ships. His writings show considerable skill in the delineation of character, much narrative, descriptive and dramatic power, combined at times with coarseness and theatricality, and they were based on much painstaking research. He may, perhaps, be said to rank first in the second order of English novelists of the 19th century, and was as popular in this country as in his own. See CLOISTER AND THE HEARTH, THE. Consult Swinburne's article in his ‹Miscellanies› (1886); ‹Charles Reade: A Memoir› (1887); Ireland, ‹Extracts,› with an introduction (1891); and the *Gentleman's Magazine* for 1882.

**READE, John,** Canadian journalist: b. Ballyshannon, Ireland, 13 Nov. 1837. He was educated at Queen's College, Belfast, and in 1856 went to Canada, where he founded the Montreal *Literary Magazine,* engaged in teaching, practised law at intervals, and in 1864 took orders in the Church of England, afterward beginning his association as editorial writer with the Montreal *Gazette* which he has ever since maintained. In 1887 he was elected president of the Montreal Society for Historical Studies. He wrote ‹The Prophecy and Other Poems› (1870); ‹Language and Conquest› (1883); ‹The Making of Canada› (1885); ‹Vita sine Liberis› (1886); ‹Aboriginal American Poetry› (1887), etc.

**READE, William Winwood,** English traveler and novelist, nephew of Charles Reade (q.v.); b. Ipsden, Oxfordshire, 30 Jan. 1838; d. Wimbledon, Surrey, 24 April 1875. He visited the western coast of Africa in 1862, and in 1868 started from Sierra Leone and reached close to the source of the Niger. He was special correspondent for the London *Times* in the Ashantee War, 1873–74. Of his literary work perhaps his most notable effort is ‹The Martyrdom of Man› (1872), a history of human slavery. His other works include ‹The Veil of Isis› (1861); ‹Savage Africa› (1863); ‹The African Sketch Book› (1873); ‹Story of the Ashantee Campaign› (1875); ‹The Outcast› (1875), etc.

**READER, Francis Smith,** American journalist: b. Coal Centre, Pa., 17 Nov. 1842. He served with the Union army throughout the Civil War, and was connected with the United States Civil Service for 10 years. Later he became editor of the Beaver Valley *News.* He published ‹Life of Moody and Sankey› (1890); ‹History of the 5th West Virginia Cavalry› (1890); ‹History of New Brighton, Pa.› (1899); ‹Some Pioneers of Washington County, Pa.› (1902); ‹History of the Newspapers of Beaver County, Pa.› (1905); ‹History of Schools, New Brighton, Pa.› (1910), and a number of historical monographs.

**READER.** See HOLY ORDERS.

**READING,** rĕd'ing, England, parliamentary and county borough and capital of the county of Berkshire, 28 miles southeast of Oxford. It has handsome municipal buildings; a public hall and free library; a museum, university college and excellent schools and a fine public park. There are remains of the magnificent Benedictine Abbey founded by Henry I, in which he was buried. Henry VIII converted the castle into a palace; later it was destroyed during the Cromwellian wars, and the gateway alone has been restored. Other churches are Saint Mary's, rebuilt from a nunnery founded by Elfrida to expiate the murder of her stepson (Edward the Martyr); Saint Lawrence (Norman), rebuilt in the 15th century; Saint Giles' (mixed architecture), and Greyfriars Church. Reading was the headquarters of the Danes in 871; was a refuge for the students who defied the Parliament; for the law courts obliged to leave London to escape the terrible plague, and was the fighting ground of rival armies during the conflicts of the rebellion. Reading is the centre of a large agricultural district, and is celebrated for its biscuits and seeds. Archbishop Laud and Goldwin Smith were natives. The borough returns one member to Parliament. Pop. 89,419.

**READING,** Mass., town in Middlesex County, on the Boston and Maine Railroad, about 10 miles north of Boston. It was settled in 1638, and six years later was incorporated. It is a beautiful residential town, and has considerable manufacturing interests. The chief manufactured products are imitation leather, wire brushes, boots and shoes, rubber and rubber goods, games, church organs and organ pipes, toys and furniture. The public library contains nearly 10,000 volumes. The government is administered by town meetings, which convene annually. Pop. (1920) 7,424.

**READING,** Ohio, village in Hamilton County, on the northern outskirts of Cincinnati, and on the Pittsburgh, Cincinnati, Chicago and Saint Louis Railroad. It is the seat of Mount Notre Dame Academy. Manufactories include fireworks, cigars and bottles, and there is also an industry in mineral waters. Pop. 3,985.

**READING,** Pa., city, county-seat of Berks County, on the Schuylkill River and the Schuylkill Canal, and on the Pennsylvania and the Philadelphia and Reading railroads, about 58 miles northwest of Philadelphia, and 54 miles east of Harrisburg. Its area is about 10 square miles. Reading was first settled by English colonists, sons of William Penn, and was named after Reading in England. In 1748 it was laid out, and in 1783 was incorporated as a borough. It was chartered as a city in 1847. It is in an agricultural region. It has extensive manufacturing and commercial interests. Immediately east of the city is Mount Penn, and south of it is Neversink Mountain. Electric railways encircle both mountains. Mount Penn is 1,140 feet above sea-level. The chief industries are connected with iron and steel productions. The chief industrial establishments are railroad shops, machine shops, foundries, optical goods, builders' hardware, paper mills, breweries, knitting mills, hosiery mills, hat factories, carriage works, cigar factories and iron and steel works. The capital invested in manufacturing in 1909 (Federal census) was $45,334,000 and the average annual output was valued at $53,232,000. The iron and steel industries had the largest invested capital and about one-fourth of the output. There were, in 1910, over 500 manufacturing establishments, representing about 100 different industries. The principal public buildings of Reading are public library, Y. M. C. A., Boys' High School and the churches. The charitable institutions are Saint Catherine's Orphan Asylum (girls), Saint Paul's orphanage (boys), the Home for Friendless Children, House of the Good Shepherd, Saint Joseph's, the Reading, and the Homœopathic hospitals. The educational institutions are the Schuylkill Seminary, two high schools and a business school.

The city has an excellent park system covering in all nearly 200 acres. The city is governed by a commission, a mayor and four councilmen. The members of the board of education are chosen by popular election. During 1915–16 there was an enrolment of more than 15,000 children, the total expenses for the year being $550,000. The annual municipal expenditures for maintenance and operation are about $1,052,000; the chief items being, for streets and public improvements, $190,000; park and public property, $150,000; public safety, $140,000; public affairs, $125,000; accounts and finance, $25,000. The waterworks cost the city originally $1,937,762. They are owned and operated by the municipality. In 1867, 1869, 1914 and 1915 the city boundaries were enlarged. Pop. (1783), when it became a borough, 2,100; (1847), when charted, 12,000; (1900) 78,961; (1910) 96,071; (1920) 107,784.

**READING OF EARLEY, Rufus Daniel Isaacs,** 1st earl, British jurist: b. London, 10 Oct. 1860. The son of a fruit merchant, he was educated at University College School, London, and in Brussels and Hanover. For a time he was a seaman on a coal ship running to South America, and acted as his father's agent in Magdeburg. He took up the study of law, was called to the bar and in 1898 became queen's counsel. In 1904 he was elected to the House of Commons as a Liberal member for Reading. In 1910 he was knighted and made successively solicitor-general and attorney-general. His part in the libel suit against Edward Mylius, who had published an old fiction to the effect that King George V had contracted an early secret marriage, won Isaacs increased royal favor, for he had already been a personal friend of the previous king. As a lawyer, Sir Rufus held a high reputation as a fair attorney, with a remarkable mastery of financial and technical details acquired as a member of the Stock Exchange. His brilliant powers of cross-examination and forensic erudition marked him for the highest honor. He was invited to a seat in the Cabinet in 1912, the first time that an attorney-general received that distinction. Together with the then Chancellor Lloyd George, he was accused of speculation in Marconi stock, admitted the charge and seemed to lose nothing in political prestige with his own party He was one of the staunchest defenders of the Liberal financial policy in the Home Rule Bill of 1913. Late in that year the lord chief justice, Lord Alverstone, retired on account of ill-health and Sir Rufus Isaacs succeeded him. He was the first Jew to hold that important position. In 1914 he was elevated to the peerage, and in 1915 headed the Anglo-French commission to the United States to arrange for the American loan of $500,000,000. On 7 Jan. 1918, the Earl of Reading was appointed British High Commissioner in the United States «in the character of Ambassador Extraordinary and Plenipotentiary on Special Mission,» with full authority over the members of all British missions sent to the United States in connection with the active prosecution of the war. Consult Gardiner, A. G., ‹Prophets, Priests and Kings› (London 1908).

**READJUSTERS,** or **REFUNDERS,** the name of a political party in Virginia, which passed several bills providing for the scaling and partial rejection of the public debt of the State. Virginia, at the close of the Civil War, was greatly improverished, burdened with a large indebtedness, and shorn of part of its territory, which had been erected into the State of West Virginia. The reconstruction government added considerably to the debt, and a keen controversy arose over the question of meeting the obligations. An act passed in the legislative session of 1870–71 to refund the debt was repealed, but the repeal was declared unconstitutional by the courts. In 1878 the legislature passed a measure known as the McCulloch bill, which provided for new bonds, to be exchanged at par for outstanding bonds, and to bear interest at 3 per cent for 10 years, 4 per cent for the following 20 years, and 5 per cent for 10 years, when the principal would fall due. This act did not satisfy those opposed to payment of the debt in full, who became known as «Readjusters,» and included in their ranks both Democrats and Republicans. Under the leadership of H. H. Riddleberger they succeeded in getting control of the legislature, and passed a bill scaling the debt from $31,102,571 to $19,665,196. This bill was vetoed by the governor. In 1881 the Readjusters obtained complete control of the State, and laws were enacted in accordance with their policy, the same course being pursued in 1884, 1886 and 1887. The United States Supreme Court delivered nine opinions declaring the readjustment measures, so far as they prohibited the receipt of State bond coupons for taxes, as provided by the McCulloch law, to be in conflict with the provision of the Federal Constitution, upholding the obligation of contracts. The State could not be coerced into payment, and matters remained unsettled until a compromise was agreed upon between the State and holders of the bonds.

**REAGAN,** rē'gan, **John Henninger,** American politician: b. Sevier County, Tenn., 8 Oct. 1818; d. Palestine, Tex., 6 March 1905. He acquired a limited collegiate education, studied law and was admitted to the bar and in May 1839 settled in the republic of Texas to practice. He was a deputy surveyor of public lands in 1839–43, was elected to the State house of representatives in 1847, served as judge of the District Court in 1852–57 and was a Democratic representative in Congress in 1857–61. In the latter year he was a member of the Secession Convention of Texas, a deputy to the Provisional Confederate Congress, and became postmaster-general of the Confederate States, and acting secretary of the Confederate treasury.

He was a member of the Texas Constitutional Convention 1875, member of the Congress 1875–97, United States Senator 1887–91, and chairman of the Texas State Railroad Commission in 1897–1903. He introduced the «Reagan Inter-State Commerce Bill,» on which the subsequent interstate commerce legislation has been based.

**REAL,** rē′al, a Spanish coin, the old unit of value in Spain. By the monetary law of June 1864, the silver real was made to weigh 1.298 grams, .81 fine and equivalent to 4½ cents. It has varied in value from 4½ to 10 cents.

**REAL NUMBERS.** See ALGEBRA.

**REAL PRESENCE,** the doctrine of the actual presence of the body and blood of Christ in the Eucharist. See CONSUBSTANTIATION; EUCHARIST; MASS; TRANSSUBSTANTIATION.

**REAL PROPERTY.** See PROPERTY, LAWS OF.

**REAL VARIABLE, Theory of Functions of the;** a mathematical science. A variable is a symbol (such as $x$ or $y$ or «time» or «temperature») which stands for any member of a class of things. A particular member of the class is called a «value» of the variable which is said to «take on» its values. One variable, $y$, is said to be a single-valued function of another variable, $x$, if to every value of $x$ there corresponds one and only one value of $y$. This is the case, for example, if $x$ stands for any number and $y = x^2$. It is customary to express such a relation between $y$ and $x$ by the equation $y = f(x)$; $x$ is called the independent and y the dependent variable. If the restriction that *only one* value of $y$ shall correspond to each value of $x$ is removed, $y$ is called a multiple-valued function of $x$. Unless otherwise provided, the word function in the following pages shall mean single-valued function.

While the notions of variable and function as thus defined apply to any class of objects whatever, they are usually thought of only in connection with classes of numbers. In fact the phrase Theory of Functions is at present understood by mathematicians to mean either the theory of functions of a complex variable (q.v.) or the theory of functions of a real variable. In a certain abstract sense, the theory of the complex variable might be supposed to include the theory of the real variable, since all values of the real variable $x_1$ are included as special values $(x_2 = 0)$ of the complex variable $x_1 + x_2\sqrt{-1}$. As matter of fact, however, the theory of functions of a complex variable has yet concerned itself but little except with analytic functions, i.e., those functions which may be thought of as defined by a power-series together with its continuations. This theory, therefore, leaves untouched the widest class of functions of the real variable. On the other hand, since the theory of functions of a complex variable gives a broader and hence more unified theory of analytic functions than can be furnished by the real function theory, these functions are not ordinarily given special attention in the latter theory. For a discussion of algebraic functions the reader is referred to the article on Algebra; for transcendental functions, i.e., functions which are not algebraic, see TRIGONOMETRY; HARMONIC ANALYSIS; EQUATIONS; SERIES, etc.

The theory of functions of a real variable is a product of the critical tendency of mathematics in the latter half of the 19th century. It has yielded comparatively few new theorems about the functions hitherto studied in applied mathematics, and has therefore had less influence on these sciences than has the complex variable theory. Its main business has been the restatement in rigorous form and with proper limitation of generality, the brilliant though sometimes inexact theorems won by the earlier students of infinitesimal calculus. For example, the study of vibrating strings, membranes, etc., and of the conduction of heat led to the celebrated trigonometric series of J. B. J. Fourier (q.v.), which was at first incorrectly supposed to furnish a method of representing an arbitrary function. The reconsideration of this series and the attempt to determine exactly what functions are expansible by trigonometric series has led to many of the most abstruse theorems about point-sets. The theory of point-sets (Punktmengen, ‹Assemblages of Points›; see article ASSEMBLAGES, GENERAL THEORY OF), it should be remarked in explanation of the proportionately large space allotted to it below, is the most characteristic feature of real function theory.

**The Real Variable.**— The real numbers are, first, the whole numbers positive and negative; second, the rational fractions of the form $m/n$ where $m$ and $n$ are whole numbers, and, third, the irrational numbers such as $\sqrt{2}$ and $\pi$. On this subject, see the articles on ARITHMETIC and ALGEBRA and the BIBLIOGRAPHY[8] at the end of this sketch. (Reference numbers such as that on the word Bibliography correspond to the numbers attached to works in the Bibliography).

The totality of real numbers is a field (Körper), i.e., a set of elements upon which can be performed the operations of addition and multiplication, according to the well-known rules.[8] We suppose also known the derived operations of subtraction, division and raising to a power. A special symbol is used to distinguish the numerical from the algebraic value of a number: if $x$ is positive, $|x| = x$, if $x$ is negative, $-|x| = x$. The relation of greater and less is indicated by the symbols $<$, $>$; $a > b$ means $a$ is greater than $b$, $a < b$ means $a$ is less than $b$. Considerable attention has been given to the problem of stating explicitly the hypotheses of the real number system. We state here only that one the discussion of which has had the most far-reaching consequences.

**Principle of Continuity.**— If $[x]$ is any set of real numbers all less than a certain number, $b$, then there is a number, $\bar{x}$, such that every number of $[x]$ is less than or equal to $\bar{x}$, and such that $\bar{x}$ is the smallest number of which this is true. In other words, $x \leqq \bar{x}$ for every $x$ of $[x]$, and if $a \leq \bar{x}$, there is a number $x'$ of $[x]$ such that $a < x'$.

Any number, such as $b$ in the statement above, which is larger than every number of a set $[x]$ is called an upper bound of $[x]$; a number smaller than every number of a set $[x]$ is called a lower bound of $[x]$. In this language the principle of continuity says that every set having any upper bound has a least upper bound. It follows immediately that every set having a lower bound has a greatest lower bound. The greatest lower bound or least upper bound of a set may or may not belong to the set. Thus, zero is the greatest lower bound of the set of all positive numbers but does not belong to it; on the other hand, zero is the least upper bound and does belong to the set of all real numbers which are not positive.

A very large proportion of the advances in critical sharpness of the modern analysts over those of the 17th and 18th centuries is due to the recognition of places where the earlier analysts had unconsciously assumed, or had neglected to apply, the principle of continuity. The form in which this postulate is here stated is due to K. Weierstrass [1, 2]. Other forms have been given by R. Dedekind[3] and G. Cantor[4]. Indeed, the theory of continuity and irrational numbers is due about equally to these three great Germans.

**Segment, Interval, Limit Point.**— By the method of analytic geometry (q.v.) there is a correspondence between the totality of real numbers and the points of a line; likewise between the set of all pairs of numbers $(x, y)$ and the points of a plane, the pair $(x, y)$ corresponding to the point of which $x$ and $y$ are the co-ordinates. On account of this correspondence, it is customary to use geometrical language in the theory of real functions; thus, the word point is used interchangeably with the word number. A linear segment is the set of all numbers $x$, $a < x < b$, or the set of all points between $a$ and $b$; a planar segment is the interior of a parallelogram with sides parallel to the co-ordinate axes, or the set of all number-pairs $(x, y)$, $a < x < b, c < y < d$. The word interval is used for a segment *plus* its boundaries, i.e., $<$ is replaced by $\leqq$ in the definition just given. A segment linear or planar as the case may be, including a point, is called a neighborhood of the point.

Among the most important consequences of the principle of continuity is the following theorem which was first stated in a slightly different form by E. Borel [11] in 1895. Since its method is essentially involved in the proof of the theorem of uniform continuity (see below) given by E. Heine[5] in 1871, it is usually called (after A. Schoenflies[6]) the Heine-Borel theorem: «Every set of segments $[\sigma]$ such that every point of an interval, $i$, is an interior point of at least one $\sigma$, has a finite subset $\sigma_1, \sigma_2, \ldots, \sigma_n$, such that every point of $i$ is an interior point of at least one $\sigma_K$ $(k = 1, 2, \ldots, n)$.»

We shall prove this theorem only for the linear case, the proof of the planar case being quite analogous. Let the end points of the interval $i$ be $a$ and $b$, $a < b$. Let $[b']$ be a set including every point, $b'$, of $i$ such that the interval $ab'$ is contained in a finite number of segments of $[\sigma]$. There is at least one $b'$; for one of the end points of any segment of $[\sigma]$ which includes $a$ is evidently a point of $[b']$. By the principle of continuity, the set of all points, $[b']$, has a least upper bound $B$, $B \leqq b$. We shall prove that $B$ is a point of $[b']$ and that $B = b$.

Let $a'' b''$, $a'' < b''$, be a segment of $[\sigma]$ including $B$. Since $B$ is the least upper bound of $[b']$ there is a point of $[b']$, $b_1'$ between $a''$ and $B$. But if $\sigma_1, \sigma_2, \ldots, \sigma_e$ is the finite set of segments including all points of the interval $ab_1'$, this set together with $a'' b''$ will include $B$, which proves that $B$ is a point of $[b']$. Moreover, if $B < b$, the set $\sigma_1, \sigma_2, \ldots, \sigma_e$ together with $a'' b''$ would include every point of an interval $ac$, $c$ being a point between $B$ and $b''$. $c$ would therefore be a point of $[b']$ contrary to the hypothesis that $B$ is an upper bound of $[b']$. Hence $B = b$ and the Heine-Borel theorem is proved.

A point $a$ in every neighborhood of which there are points, distinct from $a$, of a set $[x]$ is a limit point of $[x]$; $a$ either may or may not be a point of the set $[x]$. If $[x]$ is a linear set, $a$ is either the greatest lower bound of the numbers of $[x]$ greater than it or the least upper bound of the numbers of $[x]$ smaller than it. A linear point-set without an upper bound is said to have the limit point $+\infty$ and one without a lower bound to have the limit point $-\infty$. The following theorem of Weierstrass is a simple corollary of the Heine-Borel theorem.

"Every infinite set of points lying on an interval has at least one limit point.» If it had no limit point, then about every point of $i$ there would be a segment including not more than one point of $[x]$. This set of segments, by the Heine-Borel theorem, would have a finite subset including all the points of $i$. But each interval of the subset not containing more than one point of $[x]$, $[x]$ could contain at most a finite number of points, contrary to hypothesis.

If $[x]$ is a linear point-set, and if we allow $+\infty$ — pue $\infty$ to figure as limit points, the theorem may, of course, be modified to read: Every infinite linear point-set has at least one limit point.

**Theory of Linear Point-sets.**— The set of limit points of a set $[x]$ is called the first derived set of $[x]$. The first derived set of the first derived set is the second derived set, etc. The theory of successive derived sets has been highly developed by the aid of the transfinite numbers of Cantor.[4] (See ASSEMBLAGES). A set which includes its first derived set is said to be *closed* (*abgeschlossen*). A set included in its derived set is *dense in itself* (*insichdicht*). A set which is the same as its first derived set, i.e., which is both closed and dense in itself, is said to be *perfect*. An example of a set closed but not dense in itself is furnished by the number 0, together with the numbers $\frac{1}{2^n}$ $(n=1, 2, 3, \ldots)$. A set dense in itself but not closed is the set of all rational numbers. The set of all numbers is an example of a perfect set.

A set whose derived set is the set of all real numbers on a certain interval is *everywhere dense* (*überalldicht*) on this interval. Such a set has a point between every two points of the interval. A set which is everywhere dense on no interval is nowhere dense. The first of the examples above is a nowhere-dense set, the second and third are everywhere-dense sets.

If $[x]$ is a closed set, nowhere dense on an interval $ab$, and $c$ any point of $ab$ not in $[x]$ then there is a segment, including $c$, whose end points belong to $[x]$, but which contains no point of $[x]$. Such a segment is called a point-free segment of $[x]$. Thus, for every closed set $[x]$ there exists one, and only one, set of point-free segments. No two of these segments overlap.

Therefore they are an enumerable (or denumerable) set (see ASSEMBLAGES), namely, there can be only a finite number of length $\geqq \frac{b-a}{2}$, a finite number of length $\geqq \frac{b-a}{4}$, and in general only a finite number of length $\geqq \frac{b-a}{2^n}$. The set $[s]$ of end points and limit points of end points of the point-free segments is evidently a closed set and is identical with $[x]$. Since the set of point-free segments is enumerable, its end points are enumerable and thus the nowhere-dense closed set is the derived set of an enumerable set of points together with the enumerable set itself. A consequence of this which we do not stop to prove here is that there is a one-to-one correspondence between the continuum and any perfect subset of itself; the argument depends on the theory of point-free segments and the fact that the continuum is the derived set of the enumerable set of all rational numbers.[6]

The notion, length of an interval, finds a generalization in the *content* of a point-set. $[x]$ being any set of points on an interval $i$, let $\sigma_1, \sigma_2, \ldots, \sigma_n$ be any finite set of intervals of length $l_1, l_2, \ldots, l_n$, including every point of $[x]$. Let $L=l_1+l_2+\ldots+l_n$. There are, of course, an infinity of numbers, $L$. Their greatest lower bound is called the content of $[x]$ and written $c[x]$. If $[x]$ is a closed set and $S$ is the sum of the finite or infinite series obtained by taking the lengths of the point-free segments in the order of their magnitude, we have $c[x]=l-S$, where $l$ is the length of the interval $i$. Thus in the case of a closed set $[x]$ and its complementary set $[x]$, which consists of all points of the interval not points of $[x]$, we have $c[x]+c[\bar{x}]=l$.[6] This, however, is not true of sets in general. For example, the set of all rational numbers between 0 and 1 has the content unity and the set of all irrational numbers on the same interval has the same content. The notion of length is, therefore, extended by the definition of content, only to closed sets and not to sets in general. A much more far-reaching generalization of length has, however, been suggested by E. Borel[11] and carried out by H. Lebesgue[12] in connection with the theory of definite integrals (see below). (See also *Measure and Measurable Assemblages,* under ASSEMBLAGES, GENERAL THEORY OF).

**Functions Defined on an Interval.**—On account of the generality of the definition, practically no theorems are known which apply to all functions on a given interval. One of the most general theorems known is obtained by introducing the restriction that on a certain interval, $f(x)$ shall have an upper bound. By this it is meant that there shall be a number, $B$, such that for every $x$ on the given interval $f(x)\leqq B$. From the principle of continuity it is clear that a function having an upper bound upon an interval, $i$, has a least upper bound $B_0$, and by aid of the Heine-Borel theorem, it is easily proved that there is at least one point, $x_1$, on the interval, such that for every interval of $i$ which includes $x_1$, $B_0$ is the least upper bound of $f(x)$. This is a theorem of Weierstrass.[1]

Another broad class of functions is that of the monotonic functions.[1] A function, $f(x)$, is monotonic increasing if whenever $x_1<x_2$, $f(x_1)<f(x_2)$; it is monotonic decreasing if whenever $x_1<x_2$, $f(x_1)>f(x_2)$. In the case of a monotonic function, $f(x)$, not only is there a single value of $y=f(x)$ for every value of $x$, but for every value of $y$ taken on by $f(x)$ there is one and only one value of $x$. In this case it is the custom to write $x=f^{-1}(y)$ and to call $f^{-1}(y)$ the inverse function of $f(x)$. Thus every monotonic function, $f(x)$, has a single valued inverse which, however, is not necessarily defined for all values of $y$.

In antithesis to the monotonic functions stand oscillating functions, those such that on the interval under consideration there are three values of the independent variable, $x_1$, $x_2$, $x_3$, $x_1<x_2$, $x_2<x_3$ such that $f(x_1)<f(x_2)$ $f(x_2)>f(x_3)$, or $f(x_1)>f(x_2)$, $f(x_2)<f(x_3)$. There exist functions which oscillate on every interval; indeed, a function may oscillate on every interval and still be continuous and have a continuous derivative.[6] The definition of continuity is given below and of derivation in the article CALCULUS. In most investigations hitherto the functions considered have had only a finite number of oscillations, i.e., there would exist a finite set of points such that on the intervals between successive points the function would not oscillate. It is to be noted that a non-oscillating function is not necessarily monotonic; there may be intervals upon which it is a constant.

The word oscillation is also used to denote a measure of the total amount of variation of a function on a given interval, that is, the difference between the upper and lower bounds of $f(x)$. This is a satisfactory measure in case $f(x)$ is monotonic. In other cases, especially in case of functions with oscillation on every interval, this scheme is naturally extended as follows: Let $x_1, x_2, x_3, \ldots, x_{n-1}$ be any finite set of points on the interval $ab$ in the order $a<x_1<x_2<x_3\ldots<x_{n-1}<b$. Calling $a=x_0$ and $b=x_n$, we have $\sum_{\kappa=1}^{n}(f(x_\kappa)-f(x_{\kappa-\delta}))=f(b)-f(a)$.

But $\sum_{\kappa=1}^{n}|f(x_\kappa)-f(x_{\kappa-1})|=R$ is, except for non-oscillating functions, different from $f(b)-f(a)$. For every infinite set of points $x_1, x_2, \ldots, x_{n-1}$, there is a value of $R$. The least upper bound, $V$, of the set of all possible numbers, $R$, is called the *variation* of $f(x)$ on the interval $ab$. A function for which $V$ is finite is called a function of limited variation; such a function can always be expressed as the difference between two monotonic functions. Functions of limited variation were first defined and studied by C. Jordan in connection with the theory of lengths of curves.

**Theory of Limits.**—Turning from the description of a function by its properties on an interval to a consideration of its appearance in the immediate neighborhood of a point, we are led to consider the notions of limits and of continuity. If $a$ is a limit point of a set of points $[x]$, then the variable $x$ is said to approach $a$ on the set $[x]$. In case all the values of $x$ are $\geqq a$, the approach is said to be from above, and in the opposite case, from below. Let $f(x)$ be a function which is defined and bounded on an interval $ab$, $a<b$, and let $x_1, x_2, \ldots$ be any set of points of $ab$ of which $a$ is the only limit point. Such a set is, for example,

$$a+\frac{b-a}{2},\ a+\frac{b-a}{4},\ \ldots\ a+\frac{b-a}{n}\ \ldots$$

The points whose co-ordinates are $(x_1, f(x_1))$, $(x_2, f(x_2))$, etc., in the graphical representation of $f(x)$ are a bounded set in the plane, and, therefore, have at least one limit point. The $x$ co-ordinate of this point cannot be other than $a$, since every other $x$ co-ordinate may be surrounded by a segment including at most one point of the set, $x_1, x_2, \ldots$. Call the $y$ co-ordinate of this point, $y_0$. The value $y_0$ is such that for every pair of positive numbers, $\varepsilon$ and $\delta$, there is a value of $x>a$, such that $|x-a|<\delta$ and $|f(x)-y_0|<\varepsilon$. A number, $y_0$, satisfying this condition is called a value approached by $f(x)$ as $x$ approaches $a$ from above. If in every interval $\overline{ax}$ of $ab$, $f(x)$ is without an upper bound, $f(x)$ is said to approach the value of $+\infty$ as $x$ approaches $a$ from above; if $f(x)$ is without a lower bound in every interval $\overline{ax}$, $f(x)$ approaches $-\infty$. Thus we have the highly important theorem that as $x$ approaches any finite value from above (and by parity of reasoning, from below) $f(x)$ approaches at least one value, finite or infinite.

A finite value approached by $f(x)$ as $x$ approaches $+\infty$ is a number, $y_0$, such that for every pair of positive numbers, $\varepsilon$ and $\delta$, there is a value of $x$ such that $x>\delta$ and $|f(x)-y_0|<\varepsilon$, $f(x)$ approaches $+\infty$ as $x$ approaches $+\infty$ if, for every $\varepsilon$ and $\delta$, there is a value of $x$ such that $x>\delta$ and $f(x)>\varepsilon$. The definition of approach to $-\infty$ is analogous. In the case where $x$ approaches a finite value, $x_0$, from above or below or from both sides, $f(x)$ approaches $y_0$ if for every pair of positive numbers, $\varepsilon$ and $\delta$, there is a value of $x$ $(x\neq x_0)$, such that $|x-x_0|<\delta$ and $|f(x)-f(x_0)|<\varepsilon$. The theorem of the last paragraph now extends to all cases: if $x$ approaches any value finite or infinite, $f(x)$ approaches *at least one value*, finite or infinite.

If $f(x)$ approaches only one value as $x$ approaches $a$, the value approached is said to be the limit of $f(x)$ (or limiting value of $f(x)$) as $x$ approaches $a$, and is indicated by the symbol $\underset{x=a}{L}\,f(x)$ or simply $Lf(x)$. If $Lf(x)=f(a)$ the function $f(x)$ is said to be continuous at the point $x=a$. A necessary and sufficient condition for the existence of the equality $Lf(x)=b$ is the following: for every $\varepsilon>0$ there exists a $\delta_\varepsilon>0$, such that for *every* $x\neq a$ for which $|x-a|,<\delta_\varepsilon$, $|f(x)-b|<\varepsilon$. This condition, which is frequently taken as the definition of a limit,[5,7] has to be appropriately modified in the cases where $a$ and $b$ are replaced by $+\infty$ or $-\infty$. The following is a necessary and sufficient condition that $Lf(x)$ shall exist and be finite:[1,9] for every $\varepsilon>0$ there exists a $\delta_\varepsilon>0$, such that for $x'$ and $x''$ distinct from $a$ and such that $|x'-a|<\delta_\varepsilon$ and $|x''-a|<\delta_\varepsilon$, $|f(x')-f(x'')|<\varepsilon$.

The proof of these necessary and sufficient conditions and also of the following theorems must be omitted for lack of space. If $f_1(x)$ and $f_2(x)$ approach definite limiting values as $x$ approaches $a$, then $f_1(x)+f_2(x)$, $f_1(x)-f_2(x)$, and $f_1(x)\cdot f_2(x)$ approach $Lf_1(x)+Lf_2(x)$, $Lf_1(x)-Lf_2(x)$, and $Lf_1(x)\cdot Lf_2(x)$, respectively, as $x$ approaches $a$; if $Lf_2(x)\neq 0$, then $f_1(x)/f_2(x)$ approaches $Lf_1(x)/Lf_2(x)$. These propositions are evidently to be thought of also as propositions about continuous functions. To them should be added the statement that if $f_1(x)$ is continuous at $x=a$ and $f_2(y)$ is continuous at $y=f(a)$, then $f_2(f_1(x))$ is continuous at $x=a$. Also, if $f(x)$ is continuous at a point $x=a$, and if $f(a)$ is positive, then there is a neighborhood of $x=a$ upon which the function is positive.[1]

In the above propositions about limits it is not necessary that $f(x)$ be defined at every point of an interval. Everything we have said about $Lf(x)$ remains valid when $x$ takes values on any set of which $a$ is a limit point. Indeed, in one of the most important cases, that of the summation of series (q.v.), the independent variable takes on only integral values, and $a=+\infty$. For the following theorems, however, we assume that $f(x)$ is defined at every point of an interval.

**Continuous Functions.**—$f(x)$ is continuous on an interval $ab$ if it is continuous at every point of the interval; in particular, it must be continuous at $a$ and $b$. One of the most famous propositions of real function theory states the principle of uniform continuity:[5] if $\varepsilon$ is any positive number, there is a $\delta_\varepsilon>0$, such that on every interval of $ab$ of length less than $\delta_\varepsilon$ the oscillation of $f(x)$ is less than $\varepsilon$. Other propositions in this connection are that a continuous function has a finite maximum value $f(x_1)$ and a finite minimum value $f(x_2)$ and takes on all intermediate values.[5] An important corollary of this is that every algebraic equation of odd degree with real coefficients has one real root. If a function is monotonic and continuous, it has a monotonic and continuous inverse.

If $f_1(x)$ and $f_2(x)$ are continuous on an interval $ab$ and if $f_1(x)=f_2(x)$ on a set everywhere dense on $ab$, then $f_1(x)=f_2(x)$ at every point of the interval $ab$. The last theorem enables us to say that if a continuous function is known at every point of an everywhere-dense subset of an interval, it is known on the whole interval. Since there are enumerable everywhere-dense subsets, a continuous function is thus capable of determination by an enumerable set of conditions. This phenomenon is also manifested in the theorem that any continuous function may be expressed as a convergent series of polynomials. Generalizations of this theorem to discontinuous functions have been obtained by R. Baire,[13] the next class of functions beyond the continuous being those discontinuous functions which are representable by series of continuous functions.

The class of continuous functions includes as a subclass the differentiable functions, i.e., those continuous functions which possess at every point a derivative. (See CALCULUS). The existence of a derivative, which amounts to the condition that the graph of $f(x)$ shall possess a tangent, puts a limitation on the manner in which a function may oscillate.[7] The earlier students of calculus assumed that every continuous function may be differentiated, in fact, several proofs of this statement were offered. Weierstrass[2] was the first to give an example of a function which is everywhere continuous and such that for no interval is it differentiable at every point.

A subclass of the differentiable functions is constituted by those functions for which the second, third and in general the $n$th derivatives exist. For such a function a formal expansion by means of Taylor's formula (see SERIES; CALCULUS) is always possible, but as has been shown by A. Cauchy and A. Pringsheim,[1] this series need not always converge and, if convergent, need not represent the function. A function which may be represented by Taylor's series is called analytic. Necessary and sufficient conditions for the expansibility of functions by Taylor's series have been given by Pringsheim, but the full significance of the existence of all the derivates of a continuous function is still to be determined.

Another outstanding problem in connection with continuous functions is that of the orders of infinites and infinitesimals. A function $f(x)$ becomes infinite or infinitesimal at a point if it approaches $+\infty$, $-\infty$, or 0. If $f(x)$ and $\phi(x)$ both become infinite (or infinitesimal) at the same point, $a$, we may have their quotient approaching (1) more than one limit, (2) a unique finite limit, not zero, (3) zero, (4) $\mp\infty$. For the first case no extensive theory has been developed. In the second case the functions are said to be of the same order; in the third case $f(x)$ has an infinity of lower order or is infinitesimal of higher order than $\phi(x)$; in the fourth case $f(x)$ has an infinity of higher order or is an infinitesimal of lower order than $\phi(x)$. For analytic functions the notion of order is well established, for other functions not.

**Discontinuous Functions.**—A function may fail to be continuous at a point in several ways. In the first case, $Lf(x)$ may exist but be different from $f(a)$. In this case the discontinuity is called removable (*hebbar*), because by modifying the value of $f(a)$ to be the same as $Lf(x)$ a continuous function is obtained. If $Lf(x)$ fails to exist, $f(x)$ may still approach definite limits from above and from below. These limits are usually indicated by $f(a+0)$ and $f(a-0)$. $f(a)$ may coincide with either of them or differ from both. All these cases are referred to as discontinuities of the first kind.[1] If $f(a+0)$ or $f(a-0)$ fails to exist, that is, if $f(x)$ approaches more than one value as $x$ approaches $a$ from the right or from the left, $f(x)$ is said to have a discontinuity of the second kind at $x=a$. For this to occur, $f(x)$ must have an infinity of oscillations in every neighborhood of $x=a$. Such a function is $\sin\frac{1}{x}$ in the neighborhood of $x=0$.

It is easily provable that there is a finite or infinite greatest value approached by $f(x)$ on either side of $x=a$ and likewise a finite or infinite least value approached. These four numbers are generally denoted by $\overline{f}(a+0)$, $\overline{f}(a-0)$, $\underline{f}(a+0)$, $\underline{f}(a-0)$, The differences among these four numbers and $f(a)$ give a variety of ways of defining a measure of the amount of discontinuity at a point. For example, the lower bound of the oscillation of $f(x)$ on every interval which includes $x=a$ is the difference between the greatest and the least of these five numbers and is called the oscillation of $f(x)$ at $x=a$.

In classifying discontinuous functions according to the distributions of the points of discontinuity over an interval there are two cases of which other cases are compounds. On the one hand, are the totally discontinuous functions, i. e., functions discontinuous at every point such, for example, as the function which is $+1$ if $x$ is a rational number and $-1$ if $x$ is an irrational number. On the other hand every interval may contain a point where $f(x)$ is continuous; such a function is called point-wise discontinuous, though there is some divergence of usage in this particular.[1] A point-wise discontinuous function has the property that the points where the oscillation is greater than any fixed positive number, $\varepsilon$, constitute a nowhere-dense closed set. On considering an infinite sequence $\varepsilon, \frac{\varepsilon}{2}, \frac{\varepsilon}{4}, \ldots$ of such numbers, it is evident that the set of points of discontinuity of a point-wise discontinuous function is an enumerable set of nowhere-dense closed sets.

The theory of discontinuous functions has received perhaps its main impetus from the study of definite integrals. (See CALCULUS). The integral of $f(x)$ between $a$ and $b$, written $\int_a^b f(x)dx$, stands for $\underset{n\,\infty}{\lim}\frac{b-a}{n}\sum_{k=0}^{k=n-1} f(x_k)$, where $x_k$ lies between $a+\frac{k}{n}(b-a)$ and $a+\frac{k+1}{n}(b-a)$. The function is said to be integrable if this limit exists and is unique. It is easily seen by aid of the principle of uniform continuity that every continuous function is integrable and it is also evident that a totally discontinuous function is not integrable. Riemann proved that a necessary and sufficient condition for the integrability of a discontinuous function is that the set of points at which the oscillation of $f(x)$ is greater than any positive number shall be of content zero. Thus an integrable function is continuous or so point-wise discontinuous that the set of points of discontinuity is an enumerable set of sets of content zero.

The content of a point-set is the definite integral of a function which is equal to unity for all points of the set and to zero for all other points. Corresponding to the Borel-Lebesgue generalization of content (see *Measure and Measurable Assemblages* in ASSEMBLAGES, GENERAL THEORY OF) is a generalization of the definite integral, due to Lebesgue,[12] which extends the notion to a very broad class of functions. This generalization has been guided largely by the aim to state the definitions of differentiation and integration in such a way that they shall be inverse operations. According to the usual definitions (see CALCULUS) this is true for a limited class of functions, but there exist, on the one hand, functions whose integrals cannot be differentiated and, on the other hand, functions whose derivatives cannot be integrated. The only effective generalization of the derivative that has been suggested in this connection is the substitution for the regular limit of $[f(x)-f(x_1)]/[x-x_1]$, one of the upper and lower bounds of the values approached by it as $x$ approaches $x_1$, from above or below.

Attempts to generalize the limiting process in various directions are characteristic of the present tendencies in analysis. The principal results so far have been obtained in connection with infinite divergent series by Césaro, Mittag-Leffler, Borel[13] and others. Another class of problems is the solution of functional equations. For example, it is known that among continuous functions, if $f(x+y) = f(x) + f(y)$, then $f(x) = ax + b$. But is this true if the restriction of continuity be removed?

**Functions of More than One Variable.**— The above account has dealt entirely with functions of one variable. A single-valued function of several variables, $f(x_1, x_2 \ldots x_n)$ is a variable $y$ such that to every set of values $(x_1, x_2, \ldots x_n)$ there corresponds one, and only one, value of $y$. The theory of such functions differs from that which we have been considering mainly in that the point-sets involved are no longer linear, but, rather, $n$ dimensional. The approach to a point in a limiting process may now take place not only from two sides but by an infinity of paths. In grasping this situation, the principal idea so far advanced is that of uniform convergence (cf. SERIES). But on this subject the reader is referred to the treatises cited below.

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**REALF**, rälf, **Richard**, Anglo-American poet: b. Framfield, Sussex, 14 June 1834; d. Oakland, Cal., 28 Oct. 1878. He was the son of a rural constable and florist, and in his 17th year published a volume of crude but promising poems under the title of 'Guesses at the Beautiful.' The work was edited by Dr. Phyrne, afterward bishop of Chichester, and Realf became an idol of a circle which included Lady Byron and her daughter, Ada Lovelace; the Rev. Frederic W. Robertson, the banker-poet Rogers, the sculptor Behnes, Leigh Hunt and others. Becoming partly demented in a mysterious love affair, Lady Byron sent him to New York, where he was assistant superintendent of the Five Points House of Industry in 1855–56. Then he entered the Kansas Free-State struggle, which led him to a close connection with John Brown, by whom he was selected as Secretary of State for the new form of government he had planned for the people he expected to set free. In August 1862 he enlisted in an Illinois regiment and served under various commands till 1867. Then he passed several years in editorial work in Pittsburgh, Pa., and subsequently appeared on the lecture platform, where his 'Battle-flashes' and 'The Unwritten Story of the Martyr of Harper's Ferry' attracted wide interest. His life was a sad and strange story. He wrote some of our strongest war poems while in the army. Among his best-known productions are 'My Slain,' 'Indirection,' 'Symbolism' and 'An Old Man's Idyl.' A collection of his poems was edited by his friend Richard J. Hinton in 1899.

**REALGAR**, a gorgeous, aurora-red mineral, found massive and in transparent or translucent, monoclinic crystals of short prismatic habit. Its lustre is resinous, hardness 1.5 to 2; streak orange-red. Analysis shows that it contains sulphur 29.9, arsenic 70.1, yielding the formula $AsS$ or arsenic monosulphide, though it is usually regarded as arsenic disulphide, $As_2S_2$. Upon exposure to light it soon disintegrates, changing to a pulverulent, orange-yellow orpiment ($As_2S_3$) and white arsenolite ($As_2O_3$). It is found massive, disseminated or crystalized in the vicinity of volcanoes and in many igneous rocks, and it occurs abundantly in fine crystals in Hungary and Transylvania. It has recently been discovered in Macedonia, at Mercur in Utah, and massive, in enormous deposits, in the State of Washington. Its previous rarity precluded its use in the manufacture of arsenious oxide, for which purpose it is now extensively mined in Washington. Artificial realgar, known as «red orpiment» or «ruby sulphur,» when mixed with nitre forms «white Indian fire.»

**REALISM**, (1) a term in at least two fundamentally different seems in the history of philosophy. (*a*) During the period of scholasticism (q.v.), realism denotes the doctrine that universals have an existence which is in some sense independent of the particular things that appear to the senses. This theory is derived from Plato's doctrine of ideas, and goes back ultimately to the Socratic view that only through the concept, or universal idea, is it possible to obtain real knowledge. Plato, developing this position, maintained that the universals, as ideas, exist apart from the world of sensible appearances, and from the true and abiding reality, while the latter is merely the world of imperfect copies, the transitory and inadequate representations of this true world of supersensible existence. In spite of the differences in name, then, and the necessary difference of interest in the problem due to the special intellectual outlook of the times, mediæval Realism in its earlier and extreme form is identical in standpoint with Platonic Idealism. The later mediæval realists, under the criticism of nominalism (q.v.), modified the extreme view that universals exist apart from things, in the same direction in which Aristotle modified Plato's doctrine of the separate existence of ideas. That is, instead of defending the extreme proposition that universals exist prior to and independent of things (*universalia ante rem*), they maintained with Aristotle that the universal, the type or form, is an essential factor in constituting the particular an individual thing, and that the two are, therefore, always found together (*universalia in rebus*). The whole problem of the relation of the universal and the particular, as it presented itself to the scholastic mind, received its most adequate statement and solution at the hands of Thomas Aquinas. He pointed out that there is a sense in which all of the formulas that had been proposed by realists and nominalists alike are true and justifiable. We may say that the universal is prior to the thing and independent of it, inasmuch as we must suppose that the idea as a universal existed in the mind of God before particular things were created; and in this sense we may, therefore, accept the statement *universalia ante rem.* But it is the presence of universals that gives to particulars their reality, and it is through their presence in things that they are known to us; therefore, the formula *universalia in rebus* is justified. Furthermore, it is the particular, not the universal, that is first known to us. So that from the standpoint of our knowledge, we may admit the nominalistic proposition *universalia post rem.*

(*b*) In modern philosophy, Realism has an entirely different meaning, and is directly opposed to Idealism (q.v.). Realism in modern systems assumes many forms, just as Idealism does, and the two views approximate to each other in so-called doctrines of ideal-realism. But yet the fundamental distinction between these two types of thought remains and may be definitely stated as follows: Realism maintains that the universe is composed of a larger or smaller number of «reals» that exist in and for themselves, independently of any relation to mind. Its main historical contention has been in opposition to any theory that would reduce the world to a system of ideas. Usually the argument of the realists has been directed against the type of idealism that attempts to interpret reality in terms of the consciousness of finite individuals. But it also maintains that real things possess a being outside and in a real sense independent of the absolute experience of God. We may grant, the realist would argue, that God knows all things, yet these things are not merely his ideas, but possess a reality and independence of their own. These real things are variously conceived in the different systems. In the Scottish philosophy (founded by Thomas Reid 1710–96), we have the doctrine of «Natural Realism.» That is, things are regarded as real just as they are given through immediate perception. In knowing, the mind deals directly with independent real things. This reality is guaranteed by «Common Sense,» or the fundamental intuitions of mankind. By Kant, on the contrary, the world of perceptive experience is regarded as merely a phenomenon of consciousness. There remains for Kant, however, a world of things-in-themselves beyond experience which can never be known, but which we are necessarily obliged to think as the basis of the phenomenal world. As completely unknown and unknowable, this world of ultimate reality is incapable of any description or theoretical treatment whatever. Herbert Spencer, who speaks of his view as «Transfigured Realism,» occupies fundamentally the same position as Kant. Herbart (1776–1841), while agreeing with Kant that the world of sense-experience is phenomenal and exists only for a knowing consciousness, still holds that it is possible to define and determine by means of metaphysical investigation the nature of realty in itself. He, therefore, postulates the existence of a plurality of absolute «Reals» (*Reale*), each of which is simple and unchangeable, and between which relations obtain which give rise to the phenomenal order of experience. Leibnitz (1646–1715) in his doctrine of monads, Fechner (1801–87), and Lotze (1817–81), regarded the ultimate of nature of reality to be a system of physical forms of existence or souls. At present, especially in England and America, there is an active philosophical school which calls itself and is called the New Realism. Its distinguishing characteristic is a view of the mind which finds the unity of consciousness largely or entirely in the structural relations of the system of mental states, which when combined after another fashion are not mental at all, but components of the physical universe. It is apparent that this demands a view of relationship which considers the terms of a relation as capable of entering without change into another relational context. The New Realism is usually associated with a view that true knowledge consists in an identity of structure, and possibly also of content between the state of knowledge and the object known. In England the best known adherents of this school are B. A. W. Russell and G. E. Moore. In America the New Realists comprise R. B. Perry, E. B. Holt, F. J. W. Woodbridge, W. P. Montague, W. T. Marvin, W. B. Pitkin, E. G. Spaulding, G. S. Fullerton, J. E. Boodin and E. B. McGilvary.

(2) In the fine arts and in literature, Realism is opposed by Idealism. In general, it may be said that Realism insists on correspondence with nature, on representing things as they are actually found in experience, while idealism tends toward an imaginative treatment which does not limit itself to reality as actually known. These two methods of treatment can never be absolutely exclusive of each other. In the work of any given individual one element or the other may be most prominent, but both must be present if the picture or statue or writing is to rank as an artistic production. Both in the choice of subject and in the details of his treatment the realistic artist idealizes: that is, he interprets the actual by isolating it from the context or environment in which it appears, and which serves to some extent to hide its true significance; and, secondly, he also idealizes by representing in his treatment what

is universal and essential, omitting certain things and selecting others with this end in view. On the other hand, the idealist who «bodies forth the forms of things unseen,» or sings of «a light that never was on sea or land,» must nevertheless be «true to nature,» in the sense that his imagination must work in accordance with the laws of reality. Otherwise the result is something grotesque and fantastic. We do, however, speak of the work of any particular individual as realistic or idealistic according as the treatment shows more prominently one tendency or the other. There are three ways in which these different tendencies, or attitudes of mind, are shown in the fine arts and literature. In the choice of a subject matter, the realist selects either something actually existing, some familiar scene or well-known event, or at least, if he does not make an exact transcript of a particular object or set of occurrences, it is the concrete individual things of experience with which he deals. Idealism, aiming more directly at the representation of what is universal and typical, constructs for itself its forms and matter, choosing to express itself through a representation, it may be, of angels, Graces or Madonnas, or through a literary portrayal of events and occurrences of some past time that admits of free imaginative treatment. This difference in choice of subject matter also carries with it important variations in manner of portrayal. As realism aims more directly than idealism at correspondence with nature, it is clear that it must emphasize to a greater extent fullness and accuracy of detail. But there is also difference in the kind of detail that is chosen, and in the emphasis that is given to details of different characters. As it is the object of realism to represent its subject matter in concrete, individual form, the details which are essential to produce this impression are naturally emphasized. An idealistic treatment, on the other hand, seeking to represent more directly the universal and essential, necessarily gives an entirely different value to the various details, omitting, it may be, much that would be regarded as essential in the school of realism and giving a prominent place to what the latter might keep in the background. It is false art and a false realism, however, that emphasizes what is ugly, unpleasant and pathological in such a way as to make these the most prominent features of the total work. This realism has rightly been held to be characteristic of a decadent art, of an art that is inevitably suicidal. For the real, which it is the business of art to reveal and portray, in nature and in human nature alike, is the universal, the abiding and hence the normal; what is diseased and monstrous are necessarily particular and transient and, therefore, not real in the fullest sense. Art, like all conscious activity, can only live so long as it assumes that what is rational in the fullest sense must be that which is in the deepest sense real. See IDEALISM.

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**REALISM AND NATURALISM IN LITERATURE.** Realism in literature means that the writer represents persons, scenes, things, and facts as they are, life as it is. The word is used in many senses—as opposed to romanticism, to conventionalism, to sentimentalism, to idealism, and to imaginative treatment. Sometimes it is a term of praise, in cases in which precision and vividness of detail are considered meritorious; sometimes it is used as a term of reproach as, for example, when it is contrasted with idealized description or representation. In modern times, and in particular during the greater part of the 19th century and the earlier years of the 20th, the use of the word realism has often implied that the details brought out were of an unpleasant, sordid, obscene, or generally offensive character. Naturalism in literature should mean a style or method of writing characterized by close adherence to, or faithful representation of, nature; but, in the hands of its most notorious modern exponents, it quickly degenerated into a connotation of the more sinister features of realism. Thus a writer in the London *Daily News*, in June 1881, speaks of «That unnecessarily faithful portrayal of offensive incidents for which M. Zola has found the new name of 'Naturalism.'» This «new name» soon thereafter became a technical term to denote that remarkable outflowering of realism which predominated in French and other literatures for some 35 years from about 1860. It is obvious that in essence a distinction may properly be made between realism and naturalism as the words have come to be used. In practice, however, they are often regarded as one and the same thing, and in this article they may conveniently be treated together, although, in the course of it, it may be necessary from time to time to draw attention to the difference which actually exists.

In recent usage, the term realistic is technically applied to a 19th century school of writers; but realism, in its prime and proper sense, is as old as literature itself. We find it in Homer and Aristophanes; in the Old Testament; in the ancient Egyptian writings; in the earliest Saga literature of the Norse peoples; in the Indian, Japanese, and Chinese rogue stories of the 6th, 10th, and 13th century, respectively; in the mediæval Fabliaux; in Boccaccio and Chaucer; in the picaresque novels of Spain; in the Elizabethans; in Rabelais, Cervantes, and Voltaire; in Aphra Behn and Bunyan; in Richardson, Fielding, and Smollett, as well as in Swift and Defoe. Realism was a pronounced feature of some of the later Greek and Latin literature. Thus Lucian (b. c. 120 A.D.), in satirizing, in his ‹True Story,› the extravagances of Eastern Greek romance, gives us himself very realistic details side by side with many a romantic and impossible adventure, and he is even more outspoken in ‹The Carousal› and in ‹Lucius, or the Ass,› if indeed he is truly the author of the last-mentioned work. Still more realistic in aim is the African Lucius Apuleius (b. c. 125 A.D.) in his ‹Metamorphoses, or Golden Ass,› written in Latin. Unrestrained realism is exhibited by Gaius Petronius Arbiter (1st century A. D.) in his ‹Satiricon,› in which he describes the debauched and dissolute condition of Roman society during the early empire.

While the modern realistic novel may be said to take its remote origin from the Spanish ‹Lazarillo de Tormes› (1553), the first of a great number of picaresque, or rogue, stories — the begetters of Thomas Nash's ‹Unfortunate Traveller, or Jack Wilton› (1594) and Richard Head's ‹The English Rogue› (1665), in England, and of Sorrell's ‹Francion› (1622), Scarron's ‹Roman comique› (1651–57), Furetière's ‹Roman bourgeois› (1666), and Lesage's Gil Blas› (1715), in France — it is nevertheless the fact that the realism which sprang up in France early in the 19th century and afterward spread to other countries — England, Spain, Germany, the United States of America — was primarily a protest against romanticism. It may perhaps be reasonably said to derive, directly or indirectly, from Jean Jacques Rousseau, who, in his ‹Confessions,› had taken care that the whole of male experience, even in things considered shameful and wicked and therefore usually kept secret, was revealed to an attentive world. Leaving out of account the practically isolated case of the 18th century Nicolas Edme Restif (1734–1806), known as Restif de la Bretonne and sometimes called «the Defoe of France,» sometimes «the Rousseau of the gutter,» we shall probably be chronologically correct in saying that the newer phase of realism began with Charles Paul de Kock (1794–1871), a master of the art of working up an interesting story by the use of simple and commonplace details, gathered from observation at first hand. He was author of about 100 works, the best known of which are perhaps ‹Gustave le mauvais sujet› (1821), ‹Le barbier de Paris› (1826), ‹La laitière de Montfermeil› (1827), and ‹André le Savoyard.› Although ‹Le barbier de Paris› was translated into nearly every European language, de Kock, owing to a poor style — he was of Dutch descent — and a certain aloofness from literary and political movements, exercised no great influence on his French fellow-countrymen. The first of the 19th century realists to do that was Marie Henri Beyle (1783–1842), known as Stendhal, who, in ‹Armance› (1827), ‹Le rouge et le noir› (1831), and ‹La chartreuse de Parme› (1839), put forth vivid studies of social types, brimful of energy and passion. He was soon followed by Honoré de Balzac (1799–1850), the novels of whose ‹La comédie humaine› (1829–47), while ideal in conception, aimed to be real in detail — «human documents,» in fact — and shrank from the fullest exposition of neither vice nor passion. Next came Gustave Flaubert (1821–80), who, according to Zola, gave, in ‹Madame Bovary› (1857), the formula of the modern novel. ‹Madame Bovary,› a close and minute study of provincial bourgeois life, is the epic of the commonplace, and was meant to be, as it certainly is, a bitter satire on the last exaggerations of romanticism. In ‹Salammbô› (1862), a study in epic realism, Flaubert applied the same method to the civilization of ancient Carthage, and he continued it in his celebrated picture of Paris life, ‹L'Éducation sentimentale› (1869) and in his pessimistic ‹La tentation de Saint -Antoine› (1874). There is no doubt that Flaubert made a profound impression upon his own age. Yet it is a strange commentary on his professed efforts that one of the keenest of modern French critics, Ferdinand Brunetière, decided that, while Flaubert was a master by as just a title as Balzac, and a far greater stylist, he still was a romanticist at heart. To a certain extent, his ‹Trois Contes› (1877) might be adduced in justification of that opinion.

Soon after the appearance of the second of Flaubert's great works, Taine, by publishing ‹Le Positivisme anglais: J. St. Mill› (1864), in which he gave an excellent summary and criticism of Mill's ‹Logic,› with its insistence on the collection of attributes and on detailed description, supplied, for the assimilation of the materialistic philosophy and its application to literature, a medium and a technique of which his compatriots were not slow to avail themselves. This method, joined to the scientific sensualism which Comte had established, and Renan had developed, under the name of Positivism, rapidly became a working theory for the adventurous litterateur. From that time onward the collection of data of a biological and sociological kind, or, in other words, of detailed information concerning heredity and environment, became for many French novelists the basic principle for the study, creation, and development of character. The brothers de Goncourt (Edmond, 1822–96 and Jules, 1830–70) in ‹Germinie Lacerteux› (1865) immediately put into practice that minuteness of observation and that reporter-like assemblage of facts which was to become a special characteristic of the new realistic, or, as it now began to be called, naturalistic school. In ‹Manette Salomon› (1867) and ‹Madame Gervaisais› (1869) they jointly continued the method, in which, in ‹La fille Elisa› (1878) and other novels, Edmond persevered for many years after his brother's death. Of the new school the de Goncourts regarded themselves as the legitimate heads, and Émile Zola (1840–1902) as their most promising disciple, with Henri Céard, Joris-Karl Huysmans, Léon Hennique, Guy de Maupassant, and a host of others as lesser satellites. Of these, de Maupassant, while remaining a naturalist, outgrew the circle in virtue of his native genius. Huysmans, in ‹Marthe› (1876), a study in sordid prostitution, gave a striking example of the naturalistic, as distinct from the merely realistic, novel. Zola, however, speedily became the high-priest of the cult, the protagonist and propagandist of a savage naturalism. His theory of the experimental novel, as he called it, was that it «is a consequence of the scientific evolution of the age; it continues and completes the work of the physiologist,» although he rather nullified this position when he laid down the definition that «the realistic novel is a corner of Nature seen through a temperament.» He had been publishing since 1864. His series of 20 novels, produced under the collective title ‹Les Rougon-Macquart› (1871–93) and including ‹Le ventre de Paris› (1873); ‹L'Assommoir› (1877), and ‹Nana› (1880), are tainted with a grossness against which there were loud outcries, but many of them, just on account of that grossness, had an enormous circulation. When ‹La terre,› which appeared to pass all limits of decency, came out in 1887, even Zola's own disciples joined in its condemnation. Soon afterward, while realism remained the inspiration of most French fiction, naturalism began to decline, and when Zola died in 1902 he had survived by nearly a decade the movement of which he had been the chief exponent and spokesman. Alphonse Daudet (1840–97), a writer who also aimed to describe life as it is, was certainly influenced by the naturalistic school in ‹Sapho› (1884), but on the whole he stands apart from naturalism. Paul Bourget (b. 1852) endeavored, in ‹Mensonges› (1887) and other works, to carry realistic observation beyond mere externals into what he called «states of the soul.»

In Russia, Nikolai Gogol (1809–52), with ‹Old World Proprietors› and ‹How the two Ivans quarreled› (1835), minute studies of life in the Ukrainian villages, had already anticipated much of the «human document» theory and practice, and realism was still further illustrated by the novelists Gontcharov (1812–91), Turgenev (1818–83), Dostoyevsky (1821–81), and Tolstoy (1828–1910), and by dramatists like Ostrovsky (1823–86). Realism is by no means a spent force in Russia, as witness Artsybashev's ‹Sanin› (1907), Chapygin's ‹The White Hermitage› (1913), Shmelev's ‹The Man from the Restaurant› (1913), Kuprin's ‹The Pit,› the naturalistic short-stories of Korolenko and Potapenko, and the underworld tales of Maxim Gorky. Realism entered Germany from both France and Russia. Its principal exponents were Max Kretzer (b. 1854), sometimes known as «the German Zola,» with his socialistic novel ‹Meister Timpe› (1888); Hermann Sudermann (b. 1857), with ‹Der Katzensteg› (1889) and ‹Iolanthes Hochzeit› (1893); Gerhart Hauptmann (b. 1862), with his dramas, ‹Vor Sonnenaufgang› (1889), ‹Das Friedensfest› (1890), and ‹Rose Bernd› (1903); and Max Halbe (b. 1865), with his dramas, ‹Jugend› (1893) and ‹Mutter Erde› (1897). In Sweden, Karl Almqvist (1793–1866) was in the main a romanticist, but his later work, ‹It's All Right,› a grim picture of the evils of conventional marriage, is in the realistic vein. August Strindberg (1849–1912) produced in ‹The Red Room› (1879) what was at that period in Sweden a startlingly realistic novel, and in his novel, ‹Marriage› (1884–86), and his dramas, ‹The Father› and ‹Miss Julia,› he aimed to be both realistic and naturalistic. In Norway, Björnstjerne Björnson (1832–1910), beginning with works of a lyric and romantic-religious character, produced in ‹The Newly Wedded Pair› (1866) a realistic problem play, and in a long series of dramas and novels from 1874 to 1889 he exhibits the same realistic and analytic tendencies. Ibsen is also a realist, but he is a great deal more, for his works are, as a rule, too subtly complicated and too spiritual to be reducible to one classification. In Italy, Mathilde Serao (b. 1856) and, especially, Gabriele d'Annunzio (b. 1864), with his pagan sensualism, are perhaps the best-known representatives of the realistic school. In Spain, José Maria de Pereda (1833–1906) was the pioneer modern realist, and he was followed by Benito Pérez Galdós (b. 1845), Armando Palacio Valdés (b. 1853), and Emilia, Countess of Pardo Bazán (Señora Quiroga, b. 1851). Juan Valera (1824–1905), though not technically a realist, but rather tending consciously toward idealism in his novels, is, for all that, none the less real. In England, Henry Fielding (1707–54) insisted that the novel should show real life, and in his practice he found many 18th century imitators. In the 19th and 20th centuries among the great realistic novelists are Jane Austen (1775–1817), William Makepeace Thackeray (1811–63), Charles Dickens (1812–70), «George Eliot» (1819–80), George Meredith (1828–1909), Thomas Hardy (b. 1840), George Moore (b. 1853), Herbert George Wells (b. 1866), John Galsworthy (b. 1867), and Arnold Bennett (b. 1867). Realistic dramatists are Sir Arthur Wing Pinero (b. 1855) and George Bernard Shaw (b. 1856). Many of the modern Hiberno-English novelists and dramatists are starkly realistic, and one or two of them frankly naturalistic. In the United States of America many realistic writers sprang up in the wake of the propaganda which William Dean Howells (b. 1837), under the influence of Tolstoy, Valdés, and Galdós, carried on for many months in *Harper's Magazine*. The principal American realists are Howells himself, who may be looked on as the creator of the American novel of character as distinct from the novel of incident, Henry James (1843–1916) with his subtle psychology and his peculiar style, Hjalmar Hjorth Boyesen (1848–1905), and Paul Leicester Ford (1865–1902).

In poetry realism has not had so much sway as in the novel or the drama. Poetic realism is mainly impressionistic and tends to symbolism. It is found more or less developed in some of the poems of the German Arno Holz (b. 1863) and the French Paul Verlaine (1844–96), and it is the motive power of many of the writers of modern *vers libre* of all countries, especially when they record the impressions of observed phenomena.

The recent tendency has in general been away from crude naturalism to a saner and soberer realism. Truthful portraiture is desirable in literature, and in so far as realism and even naturalism supply solid and stabilizing literary elements they are to be commended. The high seriousness of much of modern fiction is attained by a proper use of such elements. It is against the abuse of the genre that the true artist, no less than the moralist, must always protest.

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**REALSCHULEN**, rā-äl'shoo-lĕn, a class of institutions in the German system of secondary education characterized by the emphasis laid upon the study of the sciences, mathematics and modern languages as opposed to the gymnasia in which the classics constitute the principal feature of the curriculum. The Realschule took its rise in Germany in the early part of the 18th century, but did not attain its full development until the second half of the 19th century, when the tremendous progress of science compelled, after a long struggle, the recognition of this type of school as of equal rank with the gymnasia in the national system of education. In the struggle, however, between the classical school and the scientific school a mixed form was developed, approaching more nearly to the Realschule in the importance attached to the non-humanistic branches, but including Latin in its lists of studies. This type of school is known as the Real-gymnasium, and between it and the gymnasium the differences are growing less every year, especially since the study of Greek in the Prussian gymnasia was rendered non-obligatory in 1900. Real-gymnasia are, however, included under the general designation of Realschulen, a term which, in its broadest signification, includes the following classes: (1) *Oberrealschulen* (Upper Real schools), scientific schools with a nine years’ course, giving no instruction in the ancient languages; (2) *Realgymnascien* (Real-gymnasia), scientific schools with a nine years’ course, giving instruction in Latin; (3) *Realschulen* (in a stricter sense), the same as the *Oberrealschulen*, without the highest class; (4) *Realprogymnasien*, bearing the same relation to the *Realgymnasien* as the *Realschulen* to the *Oberrealschulen;* and (5) *Höhere Bürgerschulen* (higher middle schools), offering a six years’ course without Latin. While the Real-gymnasium has been approaching the classical school in character, the Real-schools proper have been extending their scope so as to include various forms of technical and even industrial education. Graduates of Real-schools are ineligible for admission to various departments and faculties in the universities, the most liberal conditions prevaling in Prussia, where only the faculty of theology is closed to them. See GERMANY; EDUCATION; GYMNASIA, and consult Bolton, F. E., ‘The Secondary School System of Germany’ (New York 1900); and Russell, J. E., ‘German Higher Schools’ ib. 1907).

**REALTY** and the terms real property and real estate denote the interest one has in lands; it applies not only to ground but to everything which is attached or a part of it, as trees, stones, houses or other structures. Timber, grain and grass rooted to the soil are realty, though when severed they become personalty. Any crop which is an annual product of the soil when ripe is considered as personal property. Permanent buildings erected on one’s land without permission become the property of the owner of such land, without regard to the ownership of the materials. Fixtures or things which have been attached to the realty and cannot be removed without injury to it, or which have become so adapted to the building or land as to be necessary to its use, are considered a part of the realty. In addition to the elements of realty which have been above described, are rights which are connected therewith, such for example as a right of way, a right to the use of a water course and easements. An uninterrupted use of any easement or right for 20 years or any less period fixed by statute raises presumption of title. The various estates which one may possess in realty had their origin in the feudal system of England, the fundamental principle of which is that the king was the original proprietor of all the land in his kingdom, and no one came into any part of it except by gift from him, or in return for feudal services, and thus the land was divided among a graded body of owners beginning with the king’s noblemen. In the United States all the instances of feudal tenure have been abolished. In Canada the tenure by which land is held varies in the different provinces, some being largely regulated by a statute enacted during the reign of George III.

Title has been defined as a means whereby the owner of lands has the just possession of his property; title may be acquired by descent, that is, through the death of an ancestor, by purchase or by operation of law. The legal title of land is usually transferred from one person to another by means of a deed, the many essentials of which are fixed by the statutes in various jurisdictions.

The assessed valuation of real property in the United States in 1916 was $51,159,000,000, of which more than one-fifth ($11,146,000,000) was in New York State, and nearly one-tenth ($5,088,000,000) in New York City. Estimates of the actual value vary between $100,000,000,000 and $200,000,000,000.

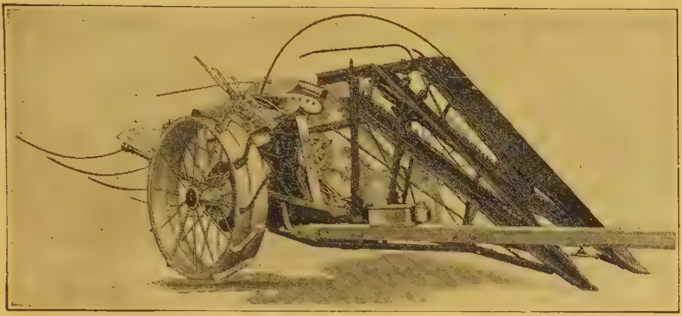
**REAM, Norman Bruce**, American financier: b. Somerset County, Pa., 5 Nov. 1844; d. 9 Feb. 1915. He was educated in the public and normal schools, and in 1861 enlisted as a private in the 85th Pennsylvania Volunteers. He was promoted lieutenant and served until invalided out of service after being wounded in action near Savannah. He afterward engaged in the live-stock and grain commission business in Chicago and became one of the principal figures in the Chicago market. He was connected with the Armours in their corner of the pork market in 1879 and in 1883 assisted in averting a collapse in the grain market. He was active in the organization of the National Biscuit Company and the United States Steel Corporation. After 1888 he devoted himself to his real estate, manufacturing and railroad interests and served as director of many railroads, banks and trust companies.

**REAM'S STATION, Battle of.** As the extension of General Grant's left to Globe Tavern on the Weldon Railroad (see GLOBE TAVERN, BATTLE OF) did not prevent General Lee's use of the road as a line of supply up to a point within a day's wagoning to Petersburg, General Grant determined to destroy the road as far down as Rowanty Creek, 13 miles beyond Globe Tavern. On 22 Aug. 1864 General Hancock, with Miles' and Gibbon's divisions of the Second corps and General Gregg's cavalry division, in all about 8,500 men, moved to the left and by night of the 24th had destroyed the road from Globe Tavern to a point three miles south of Ream's Station and 12 miles from Petersburg. During the 24th Gregg's cavalry was sharply attacked by General Butler's division of Confederate cavalry, and at night General Meade informed Hancock that Confederate infantry was moving in his direction, but as yet none had been seen by Hancock. At daylight of the 25th a cavalry reconnoissance drove in the Confederate pickets and Gibbon was ordered to move out from Ream's Station and complete the destruction of the road. Gibbon had hardly gotten well on the road, when the Union cavalry was driven in by cavalry supported by infantry and he was obliged to deploy a strong skirmish line to check the enemy in pursuit. Prisoners taken from three of Gen. A. P. Hill's divisions showed that the Confederates were in strong force and Gibbon was ordered back to the Ream's Station intrenchments, where he arrived at 10 A.M. and united with Miles' division. The intrenchments were very light and had been hurriedly thrown up by Gen. James H. Wilson in his cavalry fight near that place late in the preceding June. They ran along the railroad about 700 yards and then were drawn back on the right and left about 800 or 900 yards, at nearly right angles. Both flanks were exposed to reverse fire from the front. Miles held the right half of these works, Gibbon the left half. Gregg's cavalry held the approaches in the direction of Petersburg and Dinwiddie Court House. When Hancock's movement became known to the Confederates, Gen. A. P. Hill with the larger part of his corps, together with G. T. Anderson's brigade of Longstreet's corps and Gen. Wade Hampton's two cavalry divisions, marched to prevent the destruction of the railroad, and at 2 P.M. of the 25th General Wilcox's division made two attacks upon Miles, which were repulsed, leaving killed and wounded within a few yards of Miles' front. At 5 P.M. Hill opened a heavy artillery fire and, at the end of 15 minutes, Generals Heth and Wilcox, with five brigades and three regiments, made another assault upon Miles and a part of his line, held by raw recruits, gave way, abandoning a battery. At the same time the right of Gibbon's line gave way and two more batteries fell into possession of the Confederates. Gibbon was ordered to retake his lost ground, but his troops, many of whom were new recruits and drafted men, responded feebly and fell back under the first fire. Miles rallied the 61st New York and by desperate fighting retook a part of his line and his lost battery. Hampton's cavalry now attacked Gibbon and drove him entirely from his works, but was checked by a heavy flank fire from Gregg's dismounted cavalry, upon which Hampton turned on Gregg and forced him back to the left of a line which Gibbon had established a short distance in rear of the intrenchments from which he had been driven. An effort made to retake the intrenchments failed because of the inability of the Union commanders to induce their men to go forward. At dark Hancock withdrew from the field. General Hill made no attempt to follow up his advantage, but returned to the Petersburg intrenchments, leaving Hampton's cavalry at Ream's Station. The Union loss was 669 killed and wounded and 2,073 captured or missing, together with 12 stands of colors and nine guns. The Confederate loss, as reported by Hill, was 720, chiefly, if not entirely, killed and wounded. Consult 'Official Records' (Vol. XLII); Humphreys, 'The Virginia Campaign of 1864–65'; Walker, 'History of the Second Army Corps'; The Century Company's 'Battles and Leaders of the Civil War' (Vol. IV).

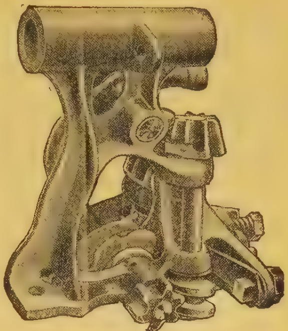
E. A. CARMAN.

**REAPERS AND BINDERS.** Technically the «reaper» is a grain harvesting machine which, in addition to cutting down the grain, gathers it into bunches ready for tying into sheaves. Speaking generally, however, the mowing machine is classed as a reaper, along with the sickle and scythe and other such simple implements. The scythe, when provided with a cradle, may be regarded as the earliest type of reaper. The first machine for reaping which actually accomplished the task was that of Henry Ogle, invented in 1826. It consisted of a straight scythe blade which ran back and forth at the rear angles of a series of triangular fingers. The cut grain fell upon a collecting board and was raked off at intervals by a workman walking beside the machine. In 1826 the Rev. Patrick Bell constructed a machine in which a number of blades on the cutting bar worked with a scissors action. At a slow speed this machine was quite effective. The first machine of the type, which is now universal, was invented in America by C. H. McCormick, who patented it in 1834. Another patent had been issued in 1833 to Obed Hussey, but the manufacture of these machines in quantity did not begin until 1845, when 150 were built by a Cincinnati firm. As many more were built in the following year. From this time onward inventors busied themselves with varying models, so that in 1852, at a contest held at Geneva, N. Y., nine different machines were entered by as many manufacturers. Compared with the highly refined reapers of the present day these machines were all exceedingly clumsy and required an excessive amount

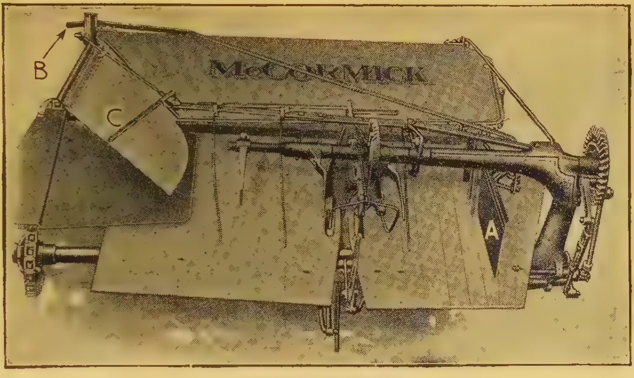
# REAPERS AND BINDERS



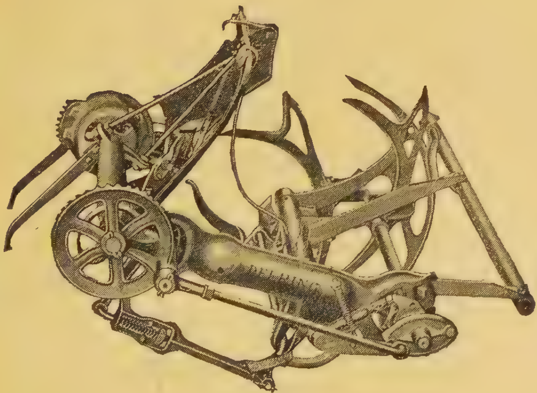
Corn Binder (Complete Machine)



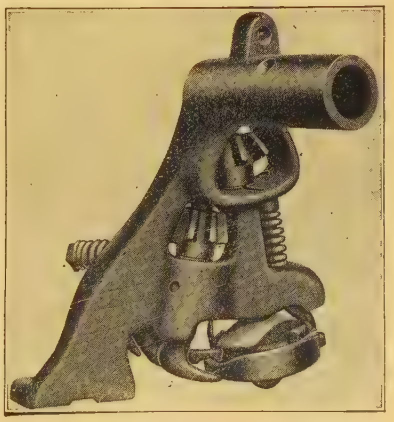
Deering Knotter



Binder Attachment



Binder Head



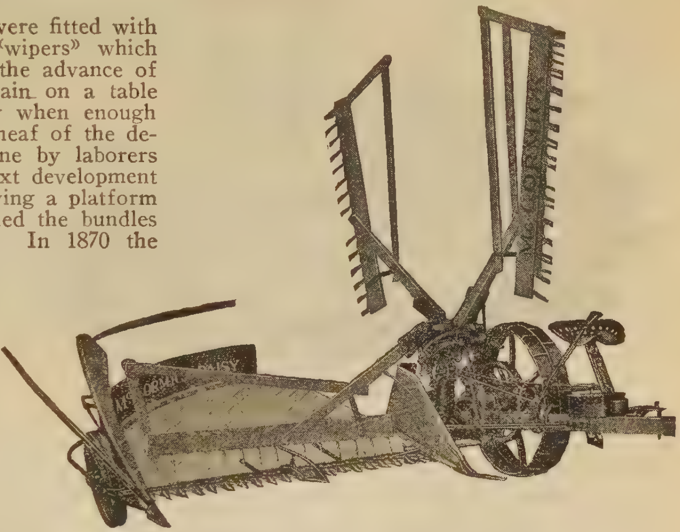
Type of Knotter

Courtesy International Harvester Co.

of power to operate them. Not one of them could be started in standing grain; the machine had to be backed up on clear ground to get the mechanism under way before the knives entered the grain. However, improvement was rapid and production increasingly large, and by 1855 nearly 10,000 of these machines were in use on the farms of the country. It is a matter of much interest to note that the American «mower and reaper» as it was called, at the French Exposition of 1855, in contest with French and English machines, cut three times the area in the same time as the French machine and three and one-fourth times the area cut by the English machine. A number of new models were brought out, and in 1857 at the New York State Fair at Syracuse 19 different machines were entered for competition, and of these only three were unable to start in standing grain.

These mowers and reapers were fitted with a revolving real or rack of «wipers» which swept the grain firmly against the advance of the cutter, gathered the cut grain on a table and shoved it off automatically when enough had been gathered to make a sheaf of the desired size. The tying was done by laborers following the machine. The next development was the Marsh «harvester,» having a platform on which two men rode and tied the bundles of grain as they accumulated. In 1870 the self-binding reaper was invented, in which the bundles of grain were tied with wire. This machine fell into great disfavor after bits of the wire amongst the grain had destroyed valuable mill-stones. The twine binder came into use in 1875, through the adaptation of a tying device invented in 1859 by John F. Appleby, who later went into the army and forgot all about it until he had invented a new rifle. The Appleby binder on the Marsh machine offered the first perfect reaper.

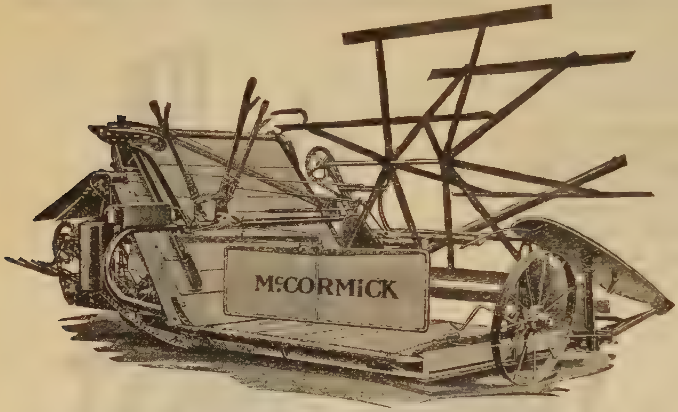
Reaping machines include three classes — manual delivery, self-raking and self-binding machines. The manual delivery is but little used now except on small holdings or when a mowing machine is converted into a reaper by being fitted with a sheafing attachment. In very hilly districts the light draught of the manual delivery machine makes it a convenient machine to work, and as at high altitudes it is often injudicious to bind the sheaf at once, as drying is impeded thereby, it may be the most profitable machine to use. On the large farm it has its place for cutting out badly storm-broken patches where bigger and heavier machines cannot be conveniently used. The ordinary manual-delivery reaper differs little from the grass mower, except that it is not necessary for it to be so highly geared and that it is provided with a sheafing rack. The operator keeps up a continuous sweeping motion, pulling the crop on to the knives and loading it on the sheafing rack, which during the time it is being loaded is brought to a somewhat vertical position, being held there by a lever controlled by the operator's foot; when loaded, the rack is allowed to fall and the sheaf slips off. The self-raking machine has a platform in the form of a quarter circle, to which the grain is reeled by the rakes, as well as removed to one side far enough to clear a fresh horse walk for the next round. The cutting bar and knives are like those of the harvester. Like the manual-delivery machine this type has but a limited use because of the fact that the grain remains unbound. For buckwheat and peas it is a favorite in some regions. It cuts usually a swath of five-foot width, requires two horses and harvests from six to eight acres per day.



Reaper (complete machine).

The self-binding reaper, the one in most general use, consists essentially of a large traveling wheel acting as the driving wheel, which carries the framework and about and above which are the various gearings and parts necessary for sheafing and binding, and of a smaller ground wheel on the off side of the cutting platform. The power is distributed from the driver to the various parts by gearing or sprocket chains. The cutting parts are very similar to those of the ordinary reaper or mower, of the serrated reciprocating knife type, driven by a Pitman rod from a crank and having the usual split fingers or guards on the bar to hold the grain while it is being cut by the sliding out of the bar. The cut grain falls upon a horizontal platform, about which is an endless canvas; the latter conveys the grain to two vertical canvases parallel to one another and moving in different directions. By these the grain is elevated and conveyed to the sheafing platform. The mechanism on the sheafing platform collects the grain as it is being constantly poured upon it and separates it into sheaves; next a binder attachment binds the sheaves and releases them, allowing them to fall straight to the ground, or, as is now more common, upon a carrier which collects a number before depositing them in convenient lots to be shocked or stooked. In binders made without vertical canvases the crop is conveyed by the platform canvas directly to the packing arms and is then gripped by the grasper carrying the twine and tied. The sheaf is lifted by a mechanical fork or arm and placed outside the horse-walk for the next round. A few years ago five-foot cuts were common with six-foot cut machines a close second. At the present time, however, seven-foot cut machines are in highest favor, and there are also a large number of eight-foot cut machines at work. The eight-foot cut is a four-horse machine and it is advisable to put this number to a seven-foot binder. If one has as much as 30 acres of grain to harvest each year, the eight-foot machine will be found economical.

Some writers have claimed that the self-binder is not profitable on a farm where less than 30 acres of grain are grown annually, although they admit that during the average life of these machines they will reap and bind about 2,000 acres. In actual practice, however, it is demonstrated every season that a self-binder is profitable, other things being equal, on a farm where 10 or more acres of grain are harvested yearly. Progressive farmers usually approach the binder proposition as follows: An initial investment of $125 at least for a three-horse self-binder; interest on this investment at 6 per cent; depreciation and repairs, 10 per cent: thus cost of binder, $125; annual interest at 6 per cent, $7.50; depreciation and repairs, 10 per cent, $12.50. According to this estimate the annual cost of the binder is $20, or $2 per acre for reaping and binding 10 acres of grain, exclusive of the cost of binder twine, man, horse or tractor labor. If more than 10 acres are to be reaped the corresponding cost per acre is lower and the greater the number of days the binder is at work the greater the return on the investment. To secure the latter it is not uncommon for a farmer owning a binder to reap his neighbors' grain in addition to his own at a price running from $1.50 to $2.50 per acre, in which case the reaper investment may be turned into an income producer instead of a liability. Another plan becoming general in regions of small farms is for two or more adjoining landholders to purchase a reaper jointly.



Binder (complete machine).

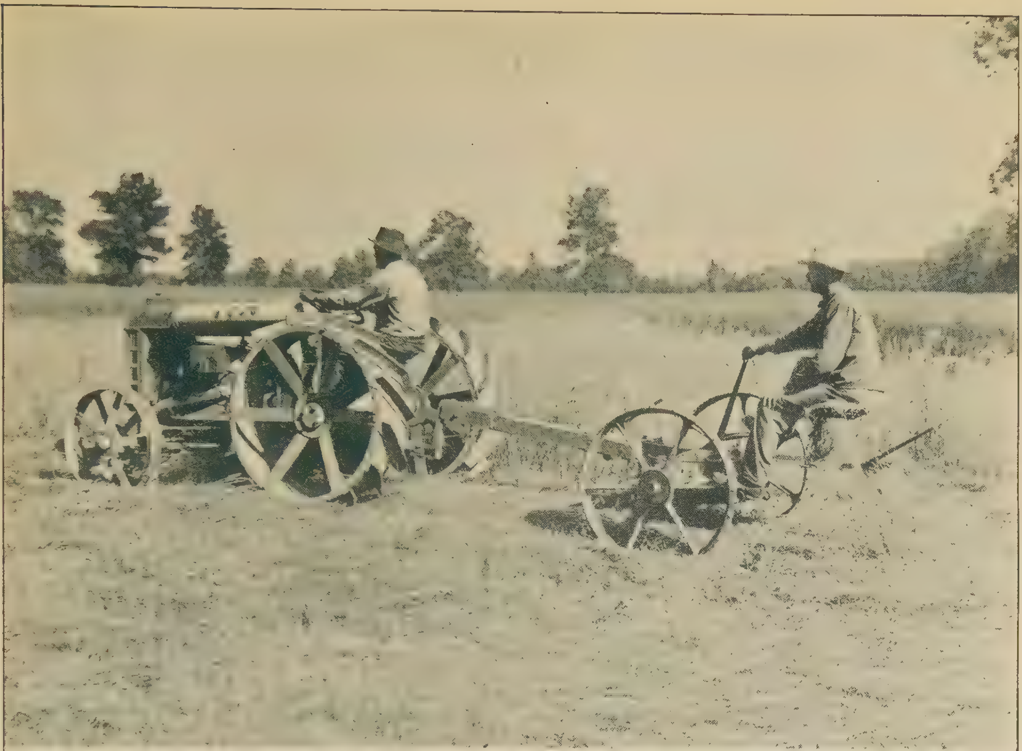
In western United States and in Australia a binder is used. The machine is an adaptation of the binder with cutter bar, knives, platform and reel similar to the latter. It is pushed ahead of the team of from four to six horses and cuts a strip of from 12 to 20 feet. The ears of grain are cut off and are then raised to wagons drawn alongside the header. A combined header and thresher is also in common use, by which the grain is cut, threshed and placed in sacks. Some of the larger types of header and thresher in use on the prairies have a capacity of 100 acres per day.

In Australia and other sections where the climate is very dry and the straw dries to brittleness, a reaper of different design is in favor. It has long comb-like teeth which strip the grain from the stalk, passing it into a mechanism which by a rubbing motion divests it of the husk and it is then winnowed, and on some large machines is ground as the harvesting proceeds.

**Bibliography.**—Ardrey, 'American Agricultural Implements' (Chicago 1894); Casson, H. V., 'Official Retrospective Exhibit of the Development of Harvesting Machinery at the Paris Exposition, 1900' (Paris 1900); id., 'The Romance of the Reaper' (New York 1908); Davidson and Chase, 'Farm Machinery and Farm Motors' (New York 1908); Ramsower, H. C., 'Equipment for the Farm and the Farmstead' (Boston 1917); Scott, 'Textbook of Farm Engineering' (London 1885); Shearer, I., 'Farm Mechanics' (1915); Swift, 'Who Invented the Reaper?' (Chicago 1895); United States Department of Agriculture, *Farmers' Bulletins* Nos. 303 and 313 (Washington 1913–14).

**REAR** (from old French *arere,* modern *arrière,* mediæval Latin *ad retro,* to the back, backward), the hinderpart, or the part that comes last in order, of anything. A particular military or naval term as opposed to «van» abbreviated from vanguard, derived from the French *avant,* in front.

**REAR GUARD,** a body of troops detailed to protect the rear of a marching column. It is organized like an advance guard reversed, consisting, from front to rear, of reserve, support, rear party, rear point, rear cavalry. From the reserve to the point the units decrease in size. The distances between units are approximately the same as those between the corresponding units of an advance guard, i.e., in the case of a division, say one, or two miles from the main body to the reserve, 1,000 yards between the reserve and the support, 500 yards between the support proper and the rear party, 500 yards between the rear party and the point and about four or five miles between the point of the infantry and that of the rear cavalry. Rear guards will often have to be stronger than advance guards, for they are likely to cover defeated retreating troops, which obtain time to reorganize. They should hold a succession of strong positions in such a manner as to delay the enemy as much as possible without suffering overwhelming losses, but should sacrifice themselves for the main body, if this is the only way of delaying the enemy. They,



1 Mowing-Machine attached to Medium-powered Tractor
2 Modern Reaper and Binder drawn by Tractor (Daily capacity about 10 acres)

1 Modern Reaper and Binder with Tractor as Motive Power
2 Nine Tractor-Drawn Reapers with a daily capacity of 90 acres

therefore, need to be mobile and consist largely of cavalry; engineers are also useful for demolitions; advancing troops may need rear guards in hostile territory; these march behind the trains. See ADVANCE GUARDS.

**REARHORSE.** See MANTIS.

**REARICK, Peter Anton,** American naval officer: b. Maryland, 12 Nov. 1838; d. Washington, D. C., 9 Feb. 1901. He entered the navy in 1860, was appointed third assistant engineer and served through the Civil War with promotion, becoming first assistant engineer in 1864. After the war he was on duty with the Pacific squadron on the north and south Atlantic, on European and Asiatic stations, at various navy yards and as a member of the steel inspection board. In 1874 he was made chief engineer and served in that capacity until 1900, when he was retired with rank of rear-admiral.

**REASONING, or INFERENCE,** is the mental process in which we advance from some known fact or principle to the truth of some other fact which is different from the starting-point. The basis for the transition is always found in the knowledge from which we set out. This is taken or assumed to be real, and in it is found the ground and justification for the advance to something else. The differentia of reasoning thus appears to be mediation; when we reason we infer that something is true *because* something else is true. Knowledge derived from reasoning may, therefore, be termed mediate, as opposed to the *immediate* knowledge obtained from sense perception and memory. The question at once arises how any mental content can justify an advance to something different from itself? How are we ever warranted in passing from the known to the unknown? This is not merely the question that Mill raised as to whether all syllogistic reasoning — all advance from premises to conclusion — was not a *petitio principii;* but it concerns all reasoning, inductive and deductive alike. The dilemma is that if the result is not contained in the starting-point the advance does not seem to be justified; if it is already present, the reasoning shows nothing new. The view of Leibnitz was that all reasoning is analysis, a drawing out and fuller explication of the original datum of the mind. Kant pointed out that thinking involves also synthesis, new constructions and additions to the material from which it starts, and he takes as the fundamental problem of his ‹Critique of Pure Reason› the question how such synthetic judgments are possible. His answer is essentially identical with that which Aristotle gave, namely, that the mind or reason (*νοῦς*) itself enters into the process as a premise — or, in other words, that it is through the creative activity of the mind that the new truth is reached. Whether or not one can connect one fact with another in a logical way depends upon one's intellectual ability to discover points of essential resemblance or identity between facts. The good reasoner is he who can look beneath the surface and detect identities that are not at once obvious, as Newton, for example, did when he reasoned from the fall of the apple to the movements of the heavenly bodies. Reasoning, then, may be defined as the process of discovering essential resemblances or points of identity between things.

It follows from what has been said that reasoning is not a process or function of mind that can go on apart from experience. The thinkers of the modern period down almost to the end of the 18th century continued to believe that reason was a kind of special organ or faculty that could yield truth of the highest order of certainty quite apart from ordinary experience. It was Kant who first clearly and incontestably showed the impossibility of deriving knowledge from reason taken in abstraction from ordinary sense experience. Kant, however, uses the term «Understanding» (*Verstand*) for the thinking faculties as employed in interpreting experience, and reserves the name «Reason» (*Vernunft*) for the vain and illusory attempt of thought to operate in independence of any given material of experience. Apart from this terminology, however, which has not been generally followed, the result of Kant's teaching was to exhibit the close and essential connection that exists between thinking and sense-perception: on the one hand, thought is empty apart from the material of sense-perception, and, on the other, what we call ordinary perceptive experience is constantly interwoven with more or less explicit processes of reasoning. Reasoning does not go on in a vacuum, nor is it a separate and distinct function of mind that in some mysterious way spins truth out of itself. But reason is on one side a universal function of receptivity; it receives its material from every channel of experience, and is itself just the unifying, co-ordinating and systematizing life of experience. Deduction and induction are often spoken of as if they were distinct species of reasoning. Reasoning, however, is always one and the same process. It consists, as we have seen, in connecting parts of experience by the discovery of some identical element in them. This identity, as present in various particulars, we may speak of as a universal, or general, principle, and, therefore, say that when we reason we unite particulars through a general law or principle. Now, the difference between deduction and induction is a difference in the starting-point and in the direction in which we proceed. If we are already in possession of the general law, and set out to apply it to particular cases, we are using deduction. If, however, our starting-point is the particular instances, then we reason inductively to discover the universal law of connection. In both cases the structure of the completed inference is the same, and consists in the connection of particulars, in virtue of our insight into the universal law or principle expressed in them.

In this reference to a universal principle, we have also that which distinguishes reasoning from the transition from idea to idea of the associative process. In a large part of the conscious life that usually is described as thinking, one idea by its very presence seems to call up another, without the apprehension of any universal or essential law of connection. But this is mere drifting on the part of the mind. In reasoning, the mind is fully awake; it sets a definite purpose before it, and proceeds by active attention and analysis to discover essential and necessary points of connection. It thus uses association for its own purposes; so that if we define reasoning as a process of association, we must add that it is association guided and controlled at every step by the purposes of thought itself. How conscious and explicit must this direction be before we can call the process reasoning? Can animals properly be said to reason? These questions do not admit of any off-hand answer. The conscious direction of the mind, the clearness with which it apprehends the universal in the particular, is a matter of degree. We may say that some direction on the part of the mind there must be, as well as some apprehension of the terms as universal, if reasoning is to occur, without attempting to determine just when these conditions are fulfilled in any individual mind or in any species. What we call conscious reasoning is doubtless continuous with associative and instinctive mental processes that seem entirely mechanical and irrational, and the connection between the two extremes may be mediated by actually observable processes. This continuity, however, gives no justification for refusing to regard the differences as important, or for explaining either extreme of the process in terms of the other. See DEDUCTION; INDUCTION; LOGIC.

Consult Bosanquet, 'Logic' (Vol. II, London 1888); James, 'The Principles of Psychology' (Chap. xxii, New York 1890); Creighton, 'An Introductory Logic' (3rd edition, Part III, New York 1908); Stout, 'Analytic Psychology' (London 1896); Baldwin, 'On Selective Thinking' (in *Psychol. Review,* Vol. V 1898); see also the bibliography under LOGIC.

J. E. CREIGHTON,
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**RÉAUMUR,** rā-ō-mür, **René Antoine Ferchault de,** French physicist: b. La Rochelle, 28 Feb. 1683; d. La Bermondiere, Me., 17 Oct. 1757. He studied under the Jesuits at Poitiers, and afterward at Bourges, and went to Paris in 1703. His relative, the president, Hénault, introduced him to the savants of the metropolis, and in 1708 he was chosen a member of the Academy of Sciences, to which he had presented some memoirs on geometry. For nearly 50 years he continued to be one of its most active members, his labors embracing the arts, natural philosophy and natural history. He was appointed to assist in the 'Description des Divers Arts et Métiers,' published by the Academy, and in executing his part of the undertaking pointed out the way to various improvements by the application of the principles of physics and natural history. He made important observations on the formation of pearls and discovered that the «turquoises» of Languedoc consisted of the fossil teeth of extinct animals; but among his most useful researches must be reckoned those of which he gave an account in his 'Traité sur l'Art de Convertir le Fer en Acier, et d'Adoucir le Fer Fondu' (1722), in which he first made known in France the process of manufacturing steel. He received therefor a pension of 12,000 livres (about $2,400). As a natural philosopher he is principally celebrated for the invention of an improved thermometer, which he made known in 1731. (See THERMOMETER). The fabrication of porcelain also occupied much of his attention, and led him to the discovery of a kind of enamel, called the porcelain of Réaumur, in 1739. His 'Mémoires pour Servir à l'Histoire des Insects' (1734–49) places him in the first rank of modern naturalists. In it he demonstrated, among various things, the correctness of Peysonnel's assumption that corals are not plants, but animals. He bequeathed his priceless collections of minerals, plants and manuscripts to the Academy of Sciences.

**REAVIS, James Bradly,** American lawyer and jurist: b. Boone County, Mo., 1848. He entered Kentucky University, but did not complete the course, was admitted to the bar in Hannibal, Mo., in 1872, and for two years was editor of the Monroe City *Appeal.* In 1874 he removed to the West, and in 1880 settled in Washington Territory, where he established a law practice. He was a member of the upper house of the Territorial council in 1888 and a regent of the Territorial University, until Washington became a State. In 1889 he was an unsuccessful candidate for supreme judge, and from 1896 to 1902 was chief justice of the Washington Supreme Court.

**REBAPTIZERS,** those who taught that the repetition of baptism was under certain circumstances imperative. The term is specifically used of the Baptists who enforce rebaptism in the case of all who have not been baptized by immersion. Views with regard to rebaptism have been varied. Many early Christians declared it unnecessary even for one who had been baptized by an unbeliever or by a child in play. In doubtful cases the hypothetical or conditional form was enjoined, as in the Book of Common Prayer, and in accordance with the decretal of Alexander III (1159–81).

**REBEC,** or **REBECK,** a stringed musical instrument of the violin kind, said to have been introduced by the Moors into Spain. It soon became popular all over the Continent, being the favorite instrument of minstrels and of village musicians, and up till the end of the 17th century playing the same important part at fairs, rustic games and weddings as does the violin at the present day. It was somewhat larger than the latter instrument, but had only three strings, which were tuned in fifths, and rubbed with a bow. The earliest known representation of the instrument, however, taken by the Abbé Gerbert from a manuscript of the 9th century, gives it but one string. The neck of the rebec terminated in a more or less grotesque representation of a human head. Milton in his 'L'Allegro' alludes to the instrument as the «jocund rebec.» The minstrels of the Middle Ages used four classes of rebecs, the treble, alto, tenor and bass.

**REBECCA,** a character in Scott's 'Ivanhoe,' daughter of the Jew, Isaac of York. She falls in love with Ivanhoe and nurses him after the tournament of Ashby, and he in turn saves her life by appearing as her champion in the lists after she has been convicted of sorcery and condemned to be burned at the stake. She leaves England with her father to live in Spain.

**REBECCAITES,** or **REBEKAH'S DAUGHTERS,** a singular association formed in South Wales, in 1839, for the destruction of turnpike-gates and tollhouses. The rioters were generally dressed in women's clothes, under a leader in the same guise, and made their attacks by night on horseback. The curious appellation by which they designated themselves was derived from the scriptural passage regarding Rebekah — «Let thy seed possess the gate of those who hate them.» Successful for a time they were emboldened to greater lawlessness and were attacked and dispersed by the military.

**REBEKAH LODGES.** See ODD FELLOW.

**REBEL YELL,** the cry of the Confederate troops as they rushed to battle in the Civil War, although as a matter of fact they frequently shouted the names of their States, as «On Virginia!» «On North Carolina!» — and so forth. It is difficult to interpret the rebel yell in written language. It was very different from the full-toned «hurrah» of the North, being more like a shriek. Near the crisis of a charge the men would change from a double-quick to a mad rush, wildly yelling «Y-Yo Yo — Wo-Wo,» for the triple purpose of encouraging each other and confusing and terrorizing the enemy.

**REBELLION,** an uprising with force and arms against established authority. A rebellion may be an armed outbreak for the purpose of obtaining the redress of a grievance or preventing the enforcement of an obnoxious law; Shays' Rebellion in Massachusetts having been an example of the former, and the Pennsylvania Whisky Insurrection of the latter. Rebellion of a more formidable character is that which attempts to establish a new and independent organization in place of the existing government. Such was the American Revolution and such also was the unsuccessful attempt to perpetuate the Southern Confederacy. Old World rebellions have been chiefly dynastic, at least up to the 19th century — that is, wars between reigning families and others, usually akin to them, which claimed the right to rule. The rebellion against Charles I of England was of a different character, being prompted by aspirations for civil liberty and religious reform. The expulsion of James II was of a similar motive and the American Revolution was a struggle for the inalienable rights of man.

In former ages and up to a very recent period conquered rebels were treated with great severity, being put to death, maimed or enslaved. In partly civilized countries such as China, rebels are treated now with the greatest cruelty. The more advanced nations, however, while retaining on their statute books the Draconic code of times gone by, treat beaten insurgents with leniency. After the downfall of the Southern Confederacy the only penalty inflicted was the disfranchisement for a time of the leaders of the rebellion, all being eventually admitted to the full rights of citizenship. British subjects who took sides with the Boers in the late South African War were, when convicted, imprisoned for short terms and disfranchised, although most of them probably escaped all punishment.

With the extension of suffrage came a consequent ability of the people to secure redress of wrongs without resort to violence. The causes which provoked rebellion in olden times are disappearing, while, apart from Carlist insurrections in Spain, there were no dynastic rebellions in Europe until after the opening of the World War in 1914, when the most notable ones were in Russia, where the Romanoff dynasty was displaced, Tsar Nicholas announcing the abdication of himself and his son, the immediate heir, 17 March 1917; and in Greece, where King Constantine abdicated 12 June 1917; the abdication of the ruling houses of Germany and Austria-Hungary in 1918, consequent on their defeat in the Great War. Constantine regained his throne in December 1920.

**REBELLION, War of.** See CIVIL WAR IN AMERICA.

**REBER,** rā'bĕr, **Franz von,** German art-historian: b. Cham, Bavaria, 10 Nov. 1834. He studied in Munich, Berlin and Rome, became a lecturer at the University of Munich in 1858, was appointed professor at the Polytechnicum there in 1863 and in 1869 occupied the chair of history of art in that institution. In 1873 he became director of the Royal Gallery. He has translated Vitruvius' ‹Architecture› (1865) and Rooses' ‹History of the Antwerp School of Painting› (1880), and has written ‹Geschichte der Baukunst im Altertum› (1864–67); Kunstgeschichte des Mittelalters› (1886); ‹Geschichte der Malerei vom Anfang des 14. bis zum Ende des 18. Jahrhunderts› (1894); ‹Die phrygischen Felsendenkmäler› (1897), etc.

**REBER,** rā-bār, **Napoleon Henry,** French composer: b. Muhlhausen, Alsace, 21 Oct. 1807; d. Paris, 24 Nov. 1880. After studying with Reicha and Le Sueur, he wrote chamber music of remarkable merit and in 1851 was appointed professor in the Conservatory, and succeeded Halévy in the chair of composition 1862. Among his works are ‹Le Diable Amoureux› (1840), a ballet; ‹Le Nuit de Noël› (1848); ‹Le Père Gaillard› (1852); ‹Les Papillotes de M. Benoist› (1853), and ‹Les Dames Capitaines› (1857), all four comic operas. He also produced some instrumental work of a high order — four symphonies, one overture, one series for the orchestra, three stringed quartets, one stringed quintet, one pianoforte quartet, seven pianoforte trios and miscellaneous pieces. His ‹Traité d'Harmonie› (1862) is a standard work.

**REBISSO, Louis T.,** American sculptor: b. Italy, 1837; d. Norwood, near Cincinnati, Ohio, 3 May 1899. At 20 he joined in Mazzini's attempt to establish an Italian republic (see MAZZINI, G.), and was obliged to leave Italy. Taking refuge in the United States he settled in Boston, Mass., where he worked for several years in monumental yards. Subsequently he went to Cincinnati, Ohio, where his fame as an artist developed. He had studied in Italy with the sculptor Rubalto and in the Art Academy under Professor Varni, and in Cincinnati he worked with T. D. Jones. His leading works are the equestrian statues of General McPherson in Washington, D. C.; of General Grant in Lincoln Park, Chicago, and of Gen. W. H. Harrison in Cincinnati.

**REBOUND CHECKS,** devices attached to the running-gear of automobiles and designed to check the rapid reaction of a spring which has been suddenly compressed, and thus prevent the bouncing movement of a car, which is induced by the extreme resiliency of modern springs. This reaction causes a bouncing movement, which affects the steering, and by its lifting action tends temporarily to diminish the grip of the driving wheels on the road. It is also calculated to produce side-slip, sets up a violent sway at corners and causes discomfort to passengers. Rebound checks are of varied types, one in very general favor consists of two arms, one attached to the frame and the other to the spring centre. These arms form an L-shaped link connected by a disc. The disc forms a friction-grip which tends to make the car spring drag when recovering, so that any violent reaction of the frame is absorbed by the check. Another variety, often seen on light cars, consists of a circular box attached to the frame and containing a wound-up spiral spring of great strength, the outer end of which is attached to the axle or spring clip. The action in both varieties is the same, a too-great reaction of the frame being prevented in both cases. Another method consists in introducing friction in the working of the springs. This is sometimes done by clipping together the leaves of the springs. Check-leaves are also introduced above the long spring leaf and help to retard the action of the latter when it shoots its load upward on the rebound. Another device, a cam-shaped piece with an arm, is set in a depression. When the arm is rotated — which only happens when the spring is suddenly compressed — the two rings are separated more and more from one another which action tends to squeeze together the parts of a minute clutch, one part of which is affixed to the frame and the other to the movable cam and arm-piece. See SHOCK ABSORBERS.

**REBUS**, a mode of expressing words or phrases by pictures of objects whose names bear a resemblance to those words, or to the syllables of which they are composed. Many of the ancient coats of arms were rebuses on the names of those who bore them; thus a lock and a heart for the name of Lockhart, an eye and a tun (a barrel) for that of Eyton, etc. Many family badges bore mottoes of similar import, as 'Ver non semper viret' of the Vernons. In heraldy, a rebus is a device intended to represent a proper name by a picture; a bearing or bearings on a coat of arms, containing an allusion to the name of the owner; as in the coat of the family of Arches, which consists of three arches, two simple and one double, borne on a shield; and that of the Dobell family, who bore on a sable shield a doe passant, between three bells argent. In the Middle Ages rebuses were very common among ecclesiastics and others who had no right to use armorial designs.

**RECALL, The**, or as it was formerly termed, the «imperative mandate,» is a process by which the people, at their will, may vacate any office before the expiration of the term for which the person holding that office was elected. Should any public official fail properly to perform the functions of his office or be guilty of any act indicating that he is unworthy of the future confidence of the people, a reasonable minority of the voters may petition for his recall. The recall is not a new development but has been found in Greece and in the government of the early Germanic tribes, and in the United States has been known since Revolutionary times — Pennsylvania's delegates to the Continental Congress who refused to sign the Declaration of Independence having been «recalled» and others sent in their places. Article 5 of the Articles of Confederation gave to each State the power «to recall its delegates or any of them, at any time within the year, and to send others in their stead for the remainder of the year.» The chief difference between the old and modern methods is that under the former the representative assemblies recalled the officers whom they had elected while in modern times this power of removal rests with the individual voter in the ballot booth. Los Angeles was the first American city to adopt the recall, the amendment to its charter, passed in 1903, being modeled after the cantonal law of Schaffhausen, Switzerland. From Los Angeles the movement has spread to many of the western cities, particularly to those which have adopted the commission form of government. In 1907 Iowa applied the principle to cities of 25,000 or more population and in 1908, by a large majority, Oregon made every State official, including judges of every grade, «subject to recall by the legal voters of the state or of the electoral district from which he is elected.» As applied to public officers, the Oregon law is typical, though later laws differ in minor details. In Oregon the recall petitions must bear the signatures of 25 per cent of the number of electors who voted at the preceding election in the district of the person whose recall is demanded. Should the official refuse to resign within five days after the petition is filed, his name, as well as that of any other candidate nominated, is placed upon the ballot for a special election, to be held within 20 days. This ballot contains a paragraph of not more than 200 words setting forth the reasons why recall is demanded, and a similar space is allowed the official to plead his case. If the official fails to obtain a majority of the votes cast, the successful candidate serves the unexpired term; the discredited official is deemed removed when the successful candidate has qualified for the office. But the Oregon statute contains a prohibition against the circulation of a petition to remove a State official unless he has been in office for six months, while members of the legislature may be recalled after the lapse of five days from the opening of the legislative session following their election. If a recall be unsuccessful, any further petition must be accompanied by sufficient money to cover the cost of a new election, this sum to be raised by the petitioners. Boston employs a limited power of recall. The mayor's term of office is four years but at the State election one month prior to the expiration of the mayor's second year in office the ballot must contain the question: «Shall there be an election of mayor at the next municipal election?» If the vote be in the affirmative any number of candidates may run against the mayor at the ensuing election. A general average of the laws would place the percentage of petitioners at about 25, California requiring 12 per cent for State officers, with special restrictions, while 15 per cent is necessary under the commission government laws of South Dakota and under the special charters of Oakland, Modesto, Vallejo and Santa Cruz, Cal.; 20 per cent under the commission government laws of Washington and the special charters of Grand Junction, Col., Mankato, Minn., Pontiac, Mich., Fort Worth and Denison, Tex., Parkersburg, W. Va., Stockton, Cal., Wyandotte, Mich. and Lowell, Mass.; 25 per cent under commission government laws of Montana, Wyoming, New Jersey, Kansas and the special charters of San Luis Obispo, Eureka, Bartlesville and McAlester, Cal., Sapulpa, Okla., Austin, Tex., Lawrence and Haverhill, Mass. and Gardiner, Me.; 30 per cent under commission government laws of Nebraska and under charters of Ardmore and Enid, Okla., and Colorado Springs, Col.; 33 per cent under the commission government law of Louisiana; 33⅓ per cent under the commission government law of Wisconsin and the special charter of Corpus Christi, Tex.; 35 per cent under commission government law of Idaho and in Dallas, Tex., Oklahoma City and Tulsa, Okla. and Wilmington, N. C.; 40 per cent under the special charters of Holdenville, Okla. and Knoxville, Tenn.; and 55 per cent under the commission government law of Illinois.

In South Dakota the recall may be invoked against city officials, and this process of removal has been adopted in some cities of Massachusetts, New Jersey, Florida, Alabama, Louisiana, Kansas, Nebraska, North Dakota, Wisconsin, Wyoming, Idaho, Nevada, Washington, etc. Sweeping recall amendments have been adopted in California (1911), Nevada and Colorado (1912, the law of the latter State applying to judicial decisions also), and in 1912 Arizona struck from the recall provision in its 1911 constitution the clause which excepted elective judicial officers from the operation of the recall. In 1912 Idaho and Washington, in 1913 Michigan and in 1914 Louisiana adopted amendments which made the recall operative against all State officials except the judiciary. In 1914 Kansas adopted a law which applies to appointive as well as to elective officers. In 1912 the Arizona legislature adopted a measure the intent of which was to apply the recall to United States senators, representatives and judges, but since these officials hold office under the Federal Constitution they are not directly amenable to recall in a State election. As regards a Federal judge the people may advise his resignation and suggest to the President a person they deem fitted for the position, but the question of action on the advice given depends entirely upon the judge and the President. Respecting senators and representatives, however, the advisory recall is of great moment; the candidates, who are nominated in direct primaries, are afforded the option of pledging or refusing to pledge themselves to obey an advisory vote of recall and few care to incur public opposition by withholding the pledge.

The recall of judicial decisions was proposed by Mr. Roosevelt in 1912, his idea being that the people should have the right not only to recall a decision itself but to ratify or disapprove the constitutional principle upon which the decision was based. On 21 Feb. 1912, when addressing the Ohio constitutional convention, he said: «If any considerable number of people feel that a decision is in defiance of justice, they should be given the right by petition to bring before the voters at some subsequent election, special or otherwise, as might be decided, and after the fullest opportunity for deliberation and debate, the question whether or not the judges' interpretation of the constitution is to be sustained.» In 1912 the people of Colorado initiated and adopted an amendment to the State constitution providing for the recall of judicial decisions, the use of the referendum being granted to the people for the purpose of ordering the enforcement of a statute which, after passage by the legislature and approval by the governor, has been vetoed by the State Supreme Court. See INITIATIVE; REFERENDUM.

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**RÉCAMIER**, rā-kä-mē-ā, **Jeanne François Julie Adelaide Bernard**, French social leader: b. Lyons, 4 Dec. 1777; d. Paris, 11 May 1849. She was educated at the convent of La Deserte. At 16 she went to Paris, whither her father, a wealthy banker, had transferred his business. Her extraordinary beauty and talents brought round her shoals of suitors belonging to the world of letters, finance and politics, and in 1793 she was married to Jacques Récamier, a rich banker, more than double her own age. The Récamier salon was long filled with many of the celebrities of the day. Though she wrote nothing, she, by her confidential intercourse with Chateaubriand and others, exercised no slight influence on French literature. Under the empire she was opposed to Napoleon, as he had placed her father under surveillance for his royalist tendencies, and Napoleon took his revenge by refusing to support the bank of her husband during a crisis. It accordingly failed, and Madame Récamier was obliged to quit Paris. She took up her residence with her friend Madame de Staël at Coppet, and afterward traveled, like her, until the downfall of Napoleon, when she again opened her salon in the Abbaye-aux-Bois at Paris. Consult ‹Souvenirs et Correspondance tirés des Papiers de Madame Récamier› (1859, 4th ed., 1873) and ‹Madame Récamier› (1872), both edited by her niece, Madame Lenormant; also the biography by Brunier (1875).

**RECAPITULATION**, or **BIOGENETIC LAW**, *in zoology,* terms applied to the parallel which exists between the embryonic development of an individual animal (ontogeny) and the historical evolution of its race (phylogeny). This parallel is explained by the theory of evolution (q.v.), according to which, in the words of Sidgwick, «the developmental history of the individual appears to be a short and simplified repetition, or in a certain sense a recapitulation, of the course of development of the species.» This class of facts was recognized more or less completely by the earliest naturalists, and was extensively studied and formulated by Von Baer and Agassiz previous to the explanation of them by means of the doctrine of descent; but it should be added that obscurities still exist, concerning the explanation of which embryologists are in doubt or at variance. Examples may be found in the embryological development of all vertebrates. Thus the frog develops through stages in which the embryo just before hatching is very fish-like, after hatching becomes a tadpole which exhibits many newt-like characters; and finally reaches the permanent frog stage. This accords with the comparative rank of the fish, newt and frog groups in classification; and also with the succession appearance of these groups. Man, as the highest animal, exhibits most completely these phenomena. In the earliest stages the human embryo is indistinguishable from that of any other creature. A little later the cephalic region shows gill-slits, like those which in a shark are a permanent feature, and the heart is two-chambered or fish-like. Further development closes the gill-slits, and the heart changes to the reptilian type. Here the reptiles stop, while birds and mammals advance further; but the human embryo in its progress to the higher type recapitulates and leaves features characteristic of lower mammalian forms — for instance, a distinct and comparatively long tail exists. Most of these changes are completed before the embryo is six weeks old, but some traces of primitive and obsolete structures persist throughout life as «vestiges» or «rudimentary organs,» and others appear after birth in infancy, as the well-known tendency of babies to turn their feet sideways and inward, and to use their toes and feet as grasping organs, after the manner of monkeys. This recapitulation of ancestral characters in ontogeny is not complete, however, for not all the stages are reproduced in every case, so far as can be perceived; and it is irregular and complicated in various ways among others by the inheritance of acquired characters. The most special students of it, as Haeckel, Fritz Müller, Hyatt, Balfour, etc., distinguish two sorts of recapitulation «palingenesis,» exemplified in amphibian larvæ and «cœnogenesis,» the last manifested most completely in the metamorphoses of insects. Palingenesis is recapitulation without any fundamental changes due to the later modification of the primitive method of development, while in cœnogenesis, the mode of development has suffered alterations which obscure the original process of recapitulation, or support it entirely. See Embryology, and consult authorities mentioned thereunder.

**RECAPITULATION IN PLANTS.** See Plants, Recapitulation in.

**RECEIPT,** *in law,* a written document, declaring that certain goods or a sum of money have been received. When made out in full, a receipt should contain (1) the date when the merchandise or money was received, (2) the name of the person or firm from whom received, (3) the name of the person who received it and (4) for what the money is paid or deposited. A receipt may be in full or in part payment of an account, and operates accordingly. A receipt, though evidence of payment, is not absolute proof, and this evidence may be rebutted by proving that it was given under misapprehension. A receipt made by an authorized agent is as good as one made by the principal. A joint trustee who signs a receipt for money, only because the receipt without his signature would have no effect, may, unless he is himself in default, show that he did not receive the money, and can thus remove or limit his liability; but a co-executor who is not under the necessity of signing a receipt to give it effect, is bound by the receipt that he signs.

**RECEIVER,** *in law,* is an officer of the court through whom the court, on account of its jurisdiction, takes possession of property which is the subject of a suit, for the purpose of preserving it from injury or loss, secures the proceeds and finally disposes of them according to the rights of all parties interested. Receivership is a remedial agency for the purpose of preserving the property in question from waste, destruction or deterioration pending litigation; it is auxiliary to the main action. It is a remedy which originated in the English Court of Chancery and is purely equitable. Under the existing English law, and also that in Canada, a receiver may be appointed when the court deems it just or convenient. In the United States, courts of equity have general authority to appoint receivers, and in most States by statutory provision. The courts are generally disinclined to appoint a receiver, except that from all the circumstances it appears essential for the purpose of the preservation of the property in controversy. Technical injuries and circumstances which are doubtful are insufficient. A receiver will be appointed to prevent a fraudulent transfer, or possession of property, or for the protection of estates, or of property of a partnership where dissolution is desired and the partners cannot agree; of mortgaged property, foreclosure proceedings, corporations which are insolvent, or which are fraudulently managed. The appointment of a receiver rests entirely within the discretion of the court to which the application is made, and the court also has discretion as to its choice of receiver. One will not be appointed a receiver who is not qualified to perform his duties, and he must be impartial, independent and disinterested. A corporation may be appointed a receiver if authorized by its charter. In order to obtain a receiver one must show the right to the property, or a lien upon it, or that the property in question was obtained by fraud, or is in danger of loss from waste, or the misconduct or insolvency of the party in possession, and the circumstances must show extreme necessity. A receiver is created by the court whose officer he is and is under its control, supervision and protection. His duty is purely ministerial and the utmost good faith is required of him; his acts should be with the general or special authority of the court and must be without discrimination for the interests involved. A receiver may employ counsel, agents and assistants, make necessary repairs, pay taxes and bring suits. He must keep the property insured and is required to give a bond for faithful performance of his duty. He takes complete possession of the property at the time when appointed; his liability is generally official, and he is responsible to any person who sustains loss through his negligence or misconduct in relation to his trust; he is entitled to a compensation for his services, which is in some jurisdictions fixed by statute, in others by the discretion of the court. Consult Alderson, W. A., 'Practical Treatise on the Law of Receivers' (New York 1905); High, J. L., 'Treatise on the Law of Receivers' (4th ed., Chicago 1910); Kerr, 'Law and Practice as to Receivers' (6th ed., Toronto 1912); Smith, J. W., 'The Law of Receivership' (Chicago 1897).

**RECEIVING STOLEN GOODS,** *in law,* the taking possession, with felonious intent, of goods known to have been stolen. Positive knowledge of the theft is not required to prove guilt if the circumstances are such that ordinary powers of observation would detect theft. The fact that one receiving the stolen goods may not intend to profit by it does not change the character of the offense, the act of aiding the thief being criminal. An intention to hold for a reward also comes under the classification of fraudulent intent. The offense is a felony or a misdemeanor, according to the value of the goods received and is either classed with larceny or punished with similar severity.

**RECENT PERIOD.** That division of the geological time-scale including the most recent portion of geological history. It is usually thought of as beginning with the appearance of man on the globe and running down to the present, and is, therefore, sometimes called the Human Epoch. It follows immediately upon the Pleistocene Period (q.v.) and is treated as a subdivision of this by some geologists, while others group Pleistocene and Recent under the Quaternary Period (q.v.). See GEOLOGY.

**RECHABITES,** rĕk'a̤-bīts, members of a kind of religious order in ancient Israel whose rule was in some respects like that of the Nazir or Nazarites. Like them they were bound by vow to abstain from the use of wine. In their contempt for luxuries and the ways of settled life, they chose to live in tents rather than houses, and refused to sow grain or plant vineyards; their ideal was the nomad patriarchal life amid their flocks (35 Jer., 2–19). The order had its origin in the northern kingdom of Israel and was founded by Jonadab or Jehonadab, son of Rechab (whence the name Rechabites), in the reign of Jehu, king of Israel (2 Kings, x). After the fall of the kingdom of the North a body of the Rechabites entered the kingdom of Judah and continued to live apart from cities and towns till the approach of Nebuchadnezzar they took refuge in Jerusalem. Independent Order of Rechabites is the style of a total-abstinence beneficial society founded in England 1835 and of which a branch was instituted in the United States 1842. In 1916 the order had 701,040 members in the United States and Great Britain, organized in four grand and 4,037 subordinate tents.

**RECIDIVISTS,** *in law,* offenders who relapse into former criminality. Statistics show that a large percentage of persons convicted of crime are old offenders, or recidivists. Figures differ in various countries and in various parts of the same country as to the percentage. Perhaps at least 40 per cent is the average, but in some countries as high as 70 per cent has been reported. It is quite probable that more than half the serious crimes committed to-day in the United States and in other civilized countries as well are committed by recidivists, who have adopted crime as a profession. Modern penal systems have proved unable to cope with the evil by present-day methods, and it is admitted that a change is imperative. Indefinite terms of imprisonment have been suggested and are being adopted in many countries to meet the condition. In the United Kingdom, by the Prevention of Crime Act of 1908, the courts have been empowered to add a further period of from 5 to 10 years on habitual criminals in addition to a sentence of penal servitude.

In the United States the indefinite term has been accepted also as one method to combat the evil of recidivism, and the general tendency in some States is in this direction. However, in other States there seems to be a strong sentiment growing in favor of supplying industrial training for criminals while in prison and securing employment for them on their discharge. In addition to these methods, segregation of defectives, who make up a considerable part of the inmates of prisons, and organized care of penniless children, whether orphaned or deserted, from among whose ranks many criminals are later developed, are advocated and are being put into effect. This is attacking the problem at its source, and its general adoption would, it is believed, lead to a great decrease in crime. See PENOLOGY.

**RECIFE,** Brazil. See PERNAMBUCO.

**RECIPROCAL,** *in grammar,* reflexive. Applied to verbs which have as an object a pronoun standing for the subject; as, «Bethink yourself.» It is also applied to pronouns of this class; as a noun, that which is reciprocal to another thing. Specifically, in mathematics, the quotient resulting from the division of unity by the quantity. The reciprocal of a vulgar fraction is the denominator divided by the numerator.

**RECIPROCITY.** See UNITED STATES, RECIPROCITY.

**RECITATIVE,** rĕs"ĭ-ta̤-tēv' (Italian, *recitativo*), a species of musical recitation, forming the medium between song and rhetorical declamation, and in which the composer and performer, rejecting the rigorous rules of time, endeavor to imitate the inflections, accents and emphasis of natural speech. Although the rules of time and rhythm are not strictly observed, recitative is written generally in common time, in order to facilitate the reading. In its approach to speech, therefore, recitative is mostly syllabic song, that is, each syllable has generally but one tone, and the tones themselves are less prolonged than in song strictly so called. Hence recitative has not a distinct, developed melody and a regular modulation; it may, according to the meaning of the words, pass with comparative freedom through the various tones. On the other hand, the tones of recitative are generally musical tones, of distinct height or depth generally, because in *recitativo parlante*, in the *opera buffa*, the tones become closely allied to those of speech. When recitative approaches still more to strict song, in respect to time and melody, the *arioso* originates. In short recitative may be called *declamation in musical tones*. Recitative includes the simple (by some also called the *parlante*) and the accompanied, or more properly, the *obbligato*. In simple recitative accompaniment also takes place, but it consists only in simple chords, which are given continuously, or interruptedly. In the *obbligato* recitative the instrumental accompaniment is of more importance, and consists of either sustained chords by the greater portion of the orchestral instruments, or even of florid passages. In the recitative much is left to the singer in respect to time, rhythm and melody, which require much musical judgment and knowledge of harmony, in order to agree with the *obbligato* accompaniment. Recitative was used largely in the ancient drama, and is frequent in the modern opera to express some action or passion, to relate a story, reveal a secret or design, etc. Giulio Caccini (abt. 1546–1615), called by Angelo Grillo «the father of a new style of music,» Emilio del Cavalieri (abt. 1550–99), and Claudio Monteverde (1567–1643) are each credited with having introduced the recitative in Rome. See OPERA.

**RECKE,** rĕk'ĕ, **Ernst von der,** Danish poet: b. Copenhagen, 14 Aug. 1848. His first work was a lyrical drama, ‹Bertram of Born› (1873), performed with great success at the Theatre Royal at Copenhagen. Following this came ‹King Liuvigild and his Sons› (1878), a tragedy; a dramatic poem ‹Archilochus› (1878); ‹Knud and Magnus› (1881), a tragedy; ‹Fru Jeanna› (1891), a tragic opera; and the ‹Duchess of Burgundy› (1891). Between 1876 and 1890 he published several collections of lyrics and in 1881 a great work representig six years of labor in a field in which he is a recognized master, ‹Principles of Danish Versification as Manifested in Its Historic and Systematic Development.› Besides writing books for children he has published translations of Bornier's ‹La Fille de Roland› (1876) and Rostrand's ‹Les Romanesques› (1896).

**RECKLINGHAUSEN,** rĕk'lĭng-how-zĕn, Prussia, in the province of Westphalia, 15 miles northwest of Dortmund, 31 miles southwest of Münster. It has good Catholic and Protestant schools. Its manufactures include damasks, wicks, tobacco, cabinet wares and bricks. There are coal mines in the vicinity. Pop. about 35,000.

**RECLAMATION LAWS.** Under this heading are treated two groups of statutes known respectively as the Carey Act and the Reclamation Law.

The Carey Act provides for the grant of 1,000,000 acres of desert land in each of the States in which desert land occurs upon condition that the State will secure the reclamation of these lands whereupon patent will issue to the State or its assigns. Recent legislation has increased the grant to 2,000,000 acres each for Idaho and Wyoming.

The usual plan is for the State or Territory to make a contract with a corporation by which the latter is to build the works and may make certain charges for the water rights, the State selling the lands at a price which is usually nominal.

A comparatively small amount of land has been reclaimed under the Carey Act. Of the 14 States that could have taken advantage of this act nine have requested segregations with a view to reclamation, amounting to about 3,700,000 acres. The total area which has been patented upon proof of reclamation up to 30 June 1915 is 601,573.38 acres.

It is evident, therefore, that the Carey Act did not meet some of the more difficult conditions of reclamation in the large area of arid lands that might be reclaimed, variously estimated at from 20 to 50 million acres.

As early as 20 March 1888 Congress had authorized a thorough study of the water supply of the Western States where irrigation is needed, and on 2 October of that year had made an appropriation for the selection of reservoir sites which when designated by the director of the geological survey were to be held reserved until further action of Congress. The following year another appropriation was made for continuing the work. After that no further appropriation was made for a number of years. The reservoir sites which had been reserved, numbering several hundred, were still to some extent available for use and some of them have been used by the government. A number have been take by private parties under a general permissive act of 26 Feb. 1897.

On 17 June 1902 Congress went a step further toward completing the policy initiated by the irrigation survey of 1888 and 1890 and appropriated the proceeds from the sales of public lands in the arid and semi-arid States for the construction of irrigation works. Under this act the Reclamation Service was organized and has constructed a large number of irrigation systems. The cost of construction is repaid by the water users and these repayments, together with the annual receipts from the sales of public lands, constitute a revolving fund to be used indefinitely in continuing this work. The Reclamation Service has now under irrigation more than 1,500,000 acres of land. The completed systems which have heretofore been constructed and are partially in use will provide for the irrigation of about 3,000,000 acres, and under the plan of re-expending the amount returned for the cost of the work this area may be ultimately much increased.

For a detailed statement of the work under the Reclamation Act see UNITED STATES RECLAMATION SERVICE.

**RÉCLUS,** rā-klü, **Jacques Elisée,** French geographer: b. Sainte-Foy-la-Grande, in the Gironde, 15 March 1830; d. Brussels, Holland, 4 July 1905. After being educated in the college of his native town and at the University of Berlin he traveled in Germany, England, Ireland and America. In 1859 he began to contribute to the ‹Revue des Deux Mondes› articles on geography, geology, literature, politics, social economy and other subjects, and also became associated with several geographical journals. During the siege of Paris and the Commune he was a member of the National Guard. Captured early in 1871 he was condemned to deportation, but his sentence was commuted to exile and he spent some years in Italy and Switzerland. In 1883 the Tribunal at Lyons passed sentence upon him and Prince Kropotkin as being anarchist leaders associated with the International Workingmen's Association, but Reclus escaped punishment by his absence from the country. In 1892 he was appointed professor of comparative geography in the free university of Brussels. His greatest work is his 'Nouvelle Geographie Universelle: La Terre et les Hommes' (1875–94), a splendid monument of the best geographical learning of our time. There is an English translation by Ravenstein and Keane (1887 onward). His other works include 'La Terre: Description des Phénomènes de la Vie du Globe' (1867–68), translated into English as 'The Earth' (1871); 'Histoire d'un Ruisseau' (1869); 'Nice, Cannes, Antibes, Monaco, Menton, San Remo' (1870); 'Les Phénomènes Terrestres: Les Mers et les Météores' (1873); 'Histoire d'une Montagne' (1880), translated as 'The History of a Mountain' (1881); and 'L'Evolution, la Révolution et l'Idéal Anarchique' (1898), treating of his social philosophy. His publications relating to the United States include 'Le Mississipi, études et souvenirs' (1839); 'Le delta du Mississipi et la Nouvelle Orléans' (1859); 'De l'esclavage aux États-Unis, le code noir et les esclaves' (1860); 'Les planteurs de la Louisine et les abolitionistes' (1861); 'Le Marmorisine et les États-Unis' (1861); 'Le caton et la crise Américaine' (1862); 'Les livres sur la crise Américaine: guerre de la sécession' (1862); 'Les Noirs Américains depuis la guerre civile aux États-Unis' (1863); 'Histoire de la guerre civile aux États-Unis' (1864); and 'La commission sanitaire de la guerre aux États-Unis, 1861–1864' (1864).

**RECOGNITION MARKS.** See COLORATION, PROTECTIVE.

**RECOGNIZANCE, or RECOGNISANCE,** *in law,* an obligation of record, which a man enters into before some court of record or magistrate duly authorized, with condition to do some particular act; as, to keep the peace, to pay a debt or the like. If the condition is not performed, the party bound by the bond forfeits his recognizance, as, in the case of a debt, the amount specified becomes immediately due.

**RECOLLECTIONS OF CHILDHOOD AND YOUTH.** Renan's 'Recollections of Childhood and Youth' ('Souvenirs d'Enfance et de Jeunesse') were written between 52 and 60, as the matured Orientalist and philosophic interpreter of religious evolution looked back with Celtic sensitiveness of poetic fancy on his own impressionable and strangely-ordered youth and the struggles of his adolescent manhood for intellectual emancipation. It is one of the world's rarest books of psychic interpretation and, except perhaps his 'Life of Jesus,' the work for which Renan is most widely known. It tells of his childhood at Tréguier in Brittany, subtly bringing out the divided inheritance from a father of old republican seafaring folk, and a mother, half Gascon, half Breton, of the royalist trading middle class, intense in the sincerity of her simple, exceedingly narrow devotion. The resultant psychic complexity can be traced, with his words as guide, through his whole after career. There are pleasant pictures of the seminary at Tréguier, with warm appreciation of the virtues of the Breton clergy and fascinating digressions on Breton piety. Then the 'Recollections' tell how, not yet 16, he was suddenly summoned to Dupanloup's just reorganized seminary, Saint Nicholas du Chardonnet at Paris, «morally fixed, but as ignorant as one could be, with everything to discover.» How his mind unfolded here and later at the Sulpician houses at Issy and in Paris is told with kindly discriminating account of his teachers and their ways. Gradually his philosophical and then his Hebrew studies brought about a struggle between vocation and conviction, the more intimate details of which were first revealed after his death in the correspondence with his sister Henriette, a very remarkable woman and the strongest personal influence in his life. With his breaking away from Saint Sulpice in 1845, a brief experiment at teaching in an Oratorian college, and his final self-emancipation, the 'Recollections' end. This simple story of a young man's struggle to be true to his higher self is told with a frank directness, a subtlety of psychic perception, a sympathy for all noble feeling and honest conviction that give the book singular charm. An abridgment of the 'Recollections' has been edited for schools (Boston 1902).

BENJAMIN W. WELLS,
*Author of 'Modern French Literature.'*

**RECOLLET,** rěk'ō-lět, or **RECOLLECT,** the name given to certain reformed bodies of the Franciscan and other orders in the Roman Catholic Church. Among orders of men, an offshoot of the Augustinian hermits, which, under Louis de Montaya, obtained considerable popularity in Spain, was called by this name, and the order still exists at Medina-Sidonia, Leon and Pamplona; but outside of Spain the order is better known under the title of Reformed Franciscans, who were established in France under Henry IV and Louis XIV, and spread thence into Belgium and Germany. In France, before the Revolution, this order had 168 houses, forming seven provinces, under the direction of the general of the Cordeliers. It is also known as the Friars Minor of the Strict Observance of Saint Francis. In Spain an offshoot of the Cistercian order of nuns was also called by the same name. See also ORDERS, RELIGIOUS.

**RECONCENTRADOS,** rě-kōn-sěn-trä'dō, a Spanish term applied to the inhabitants of the rural districts of Cuba forced by the Spaniards, during the final war for liberty, to go to retention camps. Governor-General Weyler issued a decree that all of the peasant class not actively engaged in the insurrection but at their homes or ranches should be «concentrated» in or near certain towns. Disobedience to this decree incurred the penalty of death. General Weyler's purpose was to desolate the island in certain parts so that the insurgents could not get aid and food. With this end in view, the abandoned homes were frequently destroyed and whatever remained of value to the Spaniards was confiscated. Whole districts in the most productive part of the island were thus laid waste. Sugar mills were burned and other industrial property destroyed. Nearly 400,000 «reconcentrados» were forced within the Spanish lines. General Blanco permitted the «reconcentrados» to return to their homes.

**RECONNAISSANCE,** rē-kŏn'ā-sạns, the examination of a territory, district, etc., or of an enemy's position, for the purpose of directing military operations. Also the preliminary examination of a country or district in reference to its general natural character, preparatory to a more particular survey for the purposes of triangulation or the construction of public works, as of a road, canal, railway, etc. The development of the aeroplane has entirely altered the character of reconnaissance in war. Formerly the cavalry were relied upon to make quick dashes into an enemy's territory and discover the nature of the roads, the high points, woods, streams, etc., and all they could learn of the enemy's strength and disposition of his force. But since the formation of aero squadrons, they have taken over nearly all this work wherever they exist, as they obviously can perform it to much better advantage. But for minor operations and for irregular warfare where aeroplanes are not available the old methods of observation obtain. Small bodies of independent cavalry are best, but where roads permit, automobiles and motorcycles are sometimes employed; or sometimes the duty will fall upon the infantry. In fact, a certain amount of reconnaissance must fall upon the infantry under any system, for the commander of forces in the field must keep himself informed as to his surroundings and guard against surprise attacks. It is common to send out small bodies of men at night to wander over the area between opposed armies and learn all they can of what is going on. A reconnaissance in force is the advance of a considerable body of troops with the idea of being able to fight effectively if attacked, or perhaps to form the vanguard of an attack. Reconnaissance is always closely allied with signaling (q.v.). See also Aeronautics, History of, and various military titles.

**RECONSTRUCTION.** See United States, Reconstruction.

**RECORD** includes anything which is set down in writing for the purpose of preserving memory and may be of a public or private nature. A record in a lawsuit is a complete written history of it from its beginning to its determination made by an officer duly authorized. In general, the rule is well settled that the pleadings which make up the record do not enter into details of the evidence, but merely set forth the conclusions or inferences, leaving the details of evidence to be supplied at the trial before a jury, or, if there is no jury, at the hearing before the judge or court. A trial by record means that one of the parties has set up some former decision of the court, while the other denies that such a decision ever existed; whereupon the only mode of solving the question is by producing the record of the former action. All books and memorials kept by public officers in accordance with the law, or which are connected with the proper discharge of their duty, are regarded as public records, as are also copies of papers which statutes require to be filed in public places. Generally anyone has a right to inspect public records and in many jurisdictions the removal of public records is regulated by statute, some of which hold that to destroy, or remove, or injure the records is a criminal offense.

**RECORDE,** rĕk'ȯrd, **Robert,** English mathematician: b. Tenby, Pembroke, about 1510; d. London, 1558. He studied at Oxford, was elected to a fellowship of All Souls' in 1531, studied, and probably taught, mathematics and medicine at Cambridge, and later was instructor in a variety of subjects at Oxford. Having gone to London, he became, it is said, physician to Edward VI and Queen Mary. In 1551 he was made general surveyor of the mines and money; but despite this post seems to have been imprisoned for debt in King's Bench prison, where he certainly died. Among his works were ‹The Grounde of Artes› (1540–1699), a work on «teachinge the worke and practise of Arithmeticke»; ‹The Urinal of Physick› (1547), a comprehensive treatise on medicine; ‹The Pathway to Knowledge, or First Principles of Geometry› (1551–1602); ‹The Whetstone of Witte, or the Second Part of Arithmetike› (1557), the former a treatise on geometry, the latter on algebra; ‹The Castle of Knowledge, a Treatise on Astronomy and the Sphere› (1551). For over a century his mathematical works were used as textbooks in the schools of England. He was the first to use the sign = for equality and to discover the method of extracting the root of multinomial algebraic expression. Besides his mathematical pre-eminence, Recorde was considered to be a skilful physician, an able lawyer and an accomplished philologist.

**RECORDER,** a title of ancient English derivation, the recorder in England being a person associated with the mayor and other magistrates of any city or borough, having jurisdiction in a court of record, for their better direction in matters of justice and proceedings according to law. The title is also given in some American States to an official having charge of real estate and other records and in New York it is applied to one of the criminal judges.

**RECORDER,** an obsolete musical instrument, formerly popular, resembling a flageolet in shape, with a mouth-piece like a bird's beak. The instrument was wider in the lower half than in the upper; its tones were soft and pleasing and an octave higher than the flute. Milton speaks in his ‹Paradise Lost› of

> The Dorian mood of flutes and soft recorders:

it is also mentioned by Shakespeare in ‹Hamlet› and Bacon, in his ‹Natural History› says: «The figures of recorders, and flutes, and fifes, are straight; but the recorder hath a less bore.» The instrument was also used to teach birds to sing.

**RECORDING OF CONVEYANCES OR DEEDS,** the official and public registration in all States of all conveyances of land, made at full length, either in the office of the clerk of the county where the land is situated, or in what is known as the register's office. The statutes requiring these records are known as Recording Acts, and their purpose is to apprise subsequent purchasers or encumbrancers of the property, of the existence of the prior deeds of conveyances and of their contents; the due recording of a conveyance is by these «acts» made constructive notice to all subsequent purchasers or encumbrancers; and unless a conveyance is so duly recorded it is void as against a subsequent purchaser or encumbrancer in good faith who has no notice of the existence of such conveyance and whose deed is first duly recorded. In some States an unrecorded deed is fraudulent and void as against all creditors of the grantor and as against subsequent purchasers or encumbrancers for value without notice, even though their deeds be not recorded; but it is generally valid as against the grantor, his heirs and devisees, or against all persons having actual notice of it; in only one of the States is an unrecorded deed void as between the parties. Recorded deeds, other things being equal, take priority according to the time of record; and a deed is deemed recorded in most of the States from the time it is filed for record, i.e., from the time the minute is made on the deed, index, or entry-book by the register or county clerk. This minute consists of the day, the hour and the minute of filing. Records of all deeds must be entered alphabetically in two indexes, one under the grantors' names, the other under the grantees' names; separate indexes and record books are kept for conveyances and mortgages. Commonly after record, the deed is delivered to the person entitled to it. In nearly all the States, in order that a deed may be recorded, a certificate of acknowledgment, before a proper officer, of its due execution is necessary, or else its execution must be proved by an attesting witness and the proof must be properly certified by a proper officer; in addition to this, a seal of the grantor is generally necessary. Generally all deeds of real estate, mortgages, contracts relating to and affecting real estate, may be recorded. A duly recorded conveyance or instrument or a certified copy thereof may be read in evidence without further proof. If the land is situated in several counties, the deed or a certified copy thereof ought to be recorded in each of the counties. The Recording Act or statute usually prescribes the manner of recording. In England the grantee receives from the grantor all the deeds affecting the property, the so-called muniments of title. This is due to the fact that conveyances are not generally recorded in that country, while such a practice is unnecessary in the United States, where the title is shown by the public record and the deed of conveyance is the only document delivered to the buyer. See TORRENS LAND SYSTEM.

**RECREATION CENTRES.** It is only in recent years that serious consideration has been given to the subject of recreation as a fixed phase of municipal life. The awakening of civic spirit, however, has shown that in order to receive the best from its citizens, the city is under obligation to endow them with both brain and brawn. As an economic and political entity, the strong, clean-minded and healthy person is the solution of many of the abusive shortcomings of city life, and to secure such, the idea of public recreation centres has taken firm hold. At first, the centre was a development of the gymnasium of the public schools, or of a place where young children might find amusements. But the idea has grown, so that to-day facilities are offered for persons of all ages or tastes.

In the United States, recreation has taken a firm hold. The parks of the upper part of the City of New York have been laid out with the idea of giving recreation facilities to the public. Central Park, with its tennis court, zoological park, art and natural history museums, mall and public concerts, rowing and skating, is the great city playground for those unable to go to the country. The athlete, golf player, tennis player and others interested in outdoor sports and civic meets finds every facility in Van Cortlandt Park, while Bronx Park, with its zoological and botanical attractions, is the resort of thousands.

For purely athletic purposes, however, there recently has been planned and instituted a series of parks throughout the older downtown sections of the city, particularly in the tenement districts. The region known as «Five Points»— once the centre of poverty and crime — has been opened up, and a large recreation centre established in the centre of the Italian colony, known now as Mulberry Bend Park. Hamilton Fish Park is another that has been created among the tenements, while De Witt Clinton Park is noted for its «farm school,» showing children the possibilities of rural life. The most interesting, perhaps, is Battery Park, at the extreme southern point of Manhattan Island, a place of interest to every visitor in the city for its notable aquarium, the immigrant landing, the view of the harbor and its shipping, and its nearby trip to the Statue of Liberty. Numerous steamboats leave from Battery Park to the many bathing and resort beaches, picnic grounds and recreation centres, such as Coney Island.

Perhaps the greatest advances in the subject of recreation have been made in Chicago, a city that a generation ago ranked very low in per capita park space. Being of a level contour in general, there were but few points that offered special park features. Recently, with the quickening of civic spirit, the city government has taken steps to improve and extend its park system, particularly with the idea of serving the public in its recreations, and to-day Chicago has not less than 60 playgrounds, which, together with the parks, cover an area of about 35,000 acres. Of chief interest, however, is the fact that recreation centres in Chicago have been developed on a plan which, for completeness, ranks with the best. The neighborhood park is a reality, a civic centre where persons of all ages may find recreation. Ball grounds, golf courses, tennis grounds, bathing beaches, swimming pools, bath houses, sand piles, lakes, reading rooms — most frequently in connection with branches of the Public Library — halls for public meetings, debate, and neighborhood theatricals, restaurants and lunch rooms, and even savings banks, are to be found in these parks. Grant Park, on the Lake Shore contiguous to the «Loop,» or business district, is one of the more recent additions. It is built in great part on made ground extending into Lake Michigan. Its chief point of interest is the Chicago Art Institute, the leading art museum of the city. Jackson Park, the former site of the Columbian Exposition, is likewise a place of interest to the lover of outdoors, on account of its golf courses and other grounds for games, but principally for its boating facilities, the many miles of lagoons for which the Exposition was noted being left in almost their original state, and the islands formed by them are now wooded with apparently their primeval foliage.

A most significant single event in recent years has been the Massachusetts playground law, essentially a local option measure. It requires every city of 10,000 or more inhabitants to vote as to whether or not it would maintain playgrounds. Nearly 100 cities have voted and over 90 per cent favorably. New Jersey passed an enabling act in 1907 and Ohio in 1908, followed by Minnesota in 1910, and since by over 20 States; by most of these acts the larger cities are empowered to issue bonds to acquire and improve sites for playgrounds and recreation centres. City playground associations have popularized the movement in the cities. Various municipalities have playground commissions which look into the needs of the cities and make plans for the future. Some of the cities with such commissions are Minneapolis, San Francisco, Oakland, Berkeley, Philadelphia and New York. In the last-named city there is a special recreation commission which has inventoried all the recreational facilities of the city and endeavors to make them adequate to actual needs. In Buffalo tramping trips with the playground children have been tried with great success. The Chicago playground association has been conducting similar trips for adults. New Orleans is accepting only such new school sites as have ample play space and is acquiring additional ground adjoining its present school buildings as fast as funds will permit. Cincinnati is also purchasing at great expense plots adjoining its older school buildings. Spokane is making similar provisions for recreational space, as are many other cities, conspicuously Rochester, N. Y. A State law of Washington requires a minimum of 100 square feet of play space per child on all new school sites. Wading pools, swimming pools and field houses are common features that add much to the attractiveness and utility of American playgrounds.

In the United States at present more than 500 cities containing populations of 5,000 or over now possess playgrounds of which about 30 per cent are maintained by voluntary contributions, 20 per cent by boards of education and the remainder in some other way by the municipalities.

The New York board of education maintains about 40 evening recreation centres for young people of both sexes. In these centres the unit of organization is the boys' or girls' club. The aggregate attendance is about 2,000,000, or an average evening attendance of 10,000. Over 100 vacation playgrounds are maintained, while in several congested districts the playgrounds and rooms of schoolhouses are open to mothers and babies of the tenements. In summer the average daily attendance at the vacation playgrounds is 77,000. In relation to recreation piers the department of docks and ferries constructed recreation piers with an upper story used for recreation purposes in eight river-front localities. These piers are open to the public from May to September or October and are maintained at an annual expense of over $170,000 for music, lighting, attendants, etc. There is a concert on each pier every evening from 8 to 10. The piers vary in size from 300 feet to about 800 feet. On hot Sundays there have been as many as 12,000 people on the larger piers In Cleveland over four-fifths of the 114 public schools have auditoriums, nearly one-third possess gymnasiums, while about one-half have one or more inside playrooms. Provision is made for the club and play activities for the after-class and evening periods which will draw boys and girls off from the street. Recreational and developmental opportunities are afforded for young people's use during leisure time, while adult public discussion of school and civic matters is facilitated in assembly halls. Many of the assembly-rooms are fitted with stereopticons, screens, stages, dressing-rooms and pianos. The after-class and evening utilization of the school edifices has assumed two main forms: (1) regular night-school sessions and (2) lettings to various clubs and organizations for miscellaneous gatherings, entertainments and indoor games. In addition, there are a small number of affairs — entertainments, dances or bazaars — gotten up by or for the pupils of the schools. Public libraries and parks are also adapted to recreational purposes. Pittsburgh's playgrounds and recreation centres comprise 13 plots costing in the aggregate over $2,000,000. Washington, D. C., has over 30 recreation centres, well equipped and supervised. Newark, N. J., maintains 17 school playgrounds, while Essex County, in which it is located, has a park commission which maintains playfields and outdoor gymnasiums in each of the city's five public parks.

In England, great strides have been made recently in providing recreation. The English are very fond of outdoor life, and provision has been made generally for grounds for cricket, football and golf in the suburban parks of the great cities. In London, the parks within the city are mostly in districts too congested to allow for sports, but the many small squares that have been opened in connection with the extension of streets and boulevards have been adapted to the needs of recreation, in particular playgrounds for children. Great changes have been made in the thickly populated Whitechapel district. Open places have been provided to give breathing space, where children may romp while their parents of the laboring class listen to music. Likewise, the open spaces around churches and schools have been devoted to the same purpose, in many cases suitable playground equipment being provided, along with qualified athletic instructors. When connected with the schools, this instruction is under the teachers. Saint James Park has a shallow wading pool that may be flooded to a considerable depth and used in winter for skating. The greatest recreation park, however, in the city is Victoria Park, Bethnal Green, in the northeast of London. Outside of the greater cities, and in the smaller towns, every inducement is given to sports of all kinds. The new garden cities, of which there are many in connection with the great industrial centres, have been built with the primary purpose of giving every advantage of recreation to their inhabitants, young and old, and playgrounds, public band concerts, bathing facilities, reading rooms, theatres and club rooms have been amply provided.

In Europe almost every city has its facilities for recreation, be it in public playgrounds, public baths, military concerts, or the many other pastimes that local needs may suggest. In Germany the policy of the city and of the government is to encourage the spirit of outdoor life. Facilities have been provided in the cities on a scientific basis. Figuring on the average size of the German family, it has been estimated that of a population of 100,000, the number of children is from 12,000 to 15,000, and for each thousand of these there should be provided from 30 to 40 acres for recreation purposes. Such plans in effect have been carried out in many cities. Playgrounds have been provided near the centres of congestion. A great proportion of these are located in connection with the public schools, and their control is vested in the teachers, who direct the outdoor exercises of their pupils as a part of the curriculum. As a rule, the children using the playgrounds are divided into groups, each of which has the freedom of the grounds twice a week, Sundays being reserved for students of the apprentice schools. These grounds in connection with the schools are suitably provided with the usual athletic and gymnasium equipment.

Modern ideas of recreation have taken firm hold in France to a great extent, but the French have never been accustomed to outdoor games to the same extent as the English or Americans. Taking Paris as an example, there are many large and small parks and squares where the inhabitants are accustomed to congregate and listen to martial music, but athletics are never of the violent sort. However, in connection with the public school system, in which education is compulsory, gymnastic and outdoor exercise and games are required. In some of the modern and model schools, grounds are fitted out with the most modern equipment with competent instruction. The city has, however, a wonderful system of attractions that further the cause of recreation. The beautiful series of boulevards leading to the Bois de Boulogne and the Bois de Vincennes is an incentive to the inhabitants to walk a great deal, and in the evenings, on Sundays and holidays these two parks are thronged with families that have gone there to spend the day, or even further, to Versailles or Saint Germain, two magnificent parks at some distance from the city. The city has one particular attraction — its numerous small steamboats on the Seine. For a few sous they will carry one far without the city limits to the country, where there are many spots that are the picnic grounds of the Parisians. Within the city are the Gardens of the Tuileries, the great childrens' playground. See also BATHS, PUBLIC; PARKS, PUBLIC.

**Bibliography.**— Curtis, Henry S., ‹Education through Play› (New York 1916); contains good bibliographies; id., ‹Play and Recreation› (Boston 1914); Playground Association of America Publications and Yearbooks furnish complete details of the movement in America and in foreign countries (New York); Perry, C. A., ‹Educational Extension› (Cleveland, O., 1916); Parks and Playgrounds Association, ‹Statement Relating to Recreation in Greater New York› (New York 1910); Sperling, H., ‹The Playground Book.›

**RECREATIVE RELIGIONISTS,** the name of an association formed in London 1866 for the purpose of providing on Sunday evenings popular lectures on scientific subjects with sacred music at intervals. An effort was made to suppress the work of the association under the provisions of the «Sunday Act,» 21 Geo. III, ch. 49, but it failed, and the Recreative Religionists or Sunday Lecture Society now figures in the registrar-general's report among «sects having registered places of worship.»

**RECRUITING.** See ARMY; ARMY ORGANIZATIONS; UNITED STATES, ARMY OF.

**RECTANGLE,** *in geometry,* a plane quadrilateral figure whose angles are all right angles. All rectangles are parallelograms, i.e., have the opposite sides parallel. An equilateral rectangle is a square. A rectangle is said to be contained by any two of the sides about one of its angles; thus, if A B and B C represent two adjacent sides, the rectangle is said to be contained by A B and B C, or, as it is sometimes expressed, it is the rectangle under A B and B C. The area of a rectangle is equal to the product of its base and altitude. Rectangles having equal bases are to each other as their altitudes; rectangles having equal altitudes are to each other as their bases.

**RECTIFY,** to refine common alcohol or spirit by distillation. The process of rectifying begins after the spirit itself has been distilled, and consists in removing the impurities from the spirit by fractional or repeated distillation, so far as possible, for it is impossible in this way to get rid of fusel oil. Whisky, brandy and rum, if genuine, are made from rectified spirit. To rectify, in geometry, means to construct a straight line equal in length to a definite portion of a curve; to rectify the globe, in astronomy or geography, means to bring the sun's place in the ecliptic on the globe to the brass meridian or to adjust it in order to prepare it for the solution of a prepared problem. See DISTILLED LIQUORS.

**RECTOR,** specifically, one who rules, governs or administers. In the Established Church of England a clergyman who has the care of a parish and has the parsonage and tithes — the clergyman of a parish where the tithes are not impropriate, as distinguished from a vicar; in the Roman Catholic Church, the head of a religious house; among the Jesuits, the head of a house that is a seminary or college; in Scotland, the head-master of an academy or important public school; in France and Scotland, the principal of a university; in England, the heads of Exeter and Lincoln colleges, Oxford. The canonical signification of the term, strictly, is a clergyman appointed to govern a parish where the chief parochial jurisdiction was vested in a religious corporation or in some non-resident dignitary. In some monastic orders the term is applied to the head of a convent. Consult Phillmore, ‹Ecclesiastical Law›; Cripp, ‹Law of the Clergy›; Whitehead, ‹Church Law.›

**RECTORITE,** a clay, or hydrated aluminum silicate similar to kaolinite, mined in Garland County, Arkansas.

**RECTUM,** the lower portion of the large intestine or colon. The term, however, is a misnomer so far as the human anatomy is concerned, for the bowel adapts itself to the curves of the sacrum and at one point doubles upon itself. The rectum is from six to eight inches long, extending from the sigmoid flexure to the anus, and is narrowest at its two extremities.

The largest and most dilatable portion (ampulla) just above the levator-ani muscle, forms a sort of pocket in which fæces, etc., lodge. The rectum has a mucous coat (membrane), gathered into transverse folds (Houston's valves), forming compartment-like spaces; a submucous and a muscular coat; and at the upper portion, where there is little motion, a peritoneal coat (mesentery).

The tendency of specialists is to consider the rectum as only that part of the bowel below the third sacral vertebra and devoid of mesentery, and to divide it into two portions, the fixed rectum and movable rectum. The rectum is in close opposition with large pelvic vessels and nerves and a portion of the small intestine; also, in the male, with the bladder, urethra and prostate gland, and in the female, with the uterus, vagina and Douglas' cul-de-sac. Its lower portion is surrounded by the hæmorrhoidal plexus of veins. The vessels forming this plexus, as also those of the vaginal and vesico-prostatic plexuses, are very large, frequently communicate and have many valves. It is in the lower portion of the rectum that hæmorrhoids or piles and many other painful affections occur, as blood-vessels and nerves are numerous and the muscles powerful.

**Diseases of the Rectum.**— These include congenital imperfections. The rectum may even be absent, or partially developed, terminating in a blind pouch; or it may abnormally open into the bladder, vagina, uterus or urethra. These imperfections can be usually remedied by the surgeon.

Threadworms or pinworms frequently inhabit the rectum and cause itching about the anus (pruritus ani). They may be destroyed by injections of lime-water or a solution of oxgall. Abscesses (caused by blows, perforation, sitting upon cold, damp seats, etc.) may form in the loose areolar tissue about the lower part of the rectum and open externally or into the rectum, leaving a fistulous tract (fistula in ano). Benign tumors, fibroma, papilloma and adenoma and also carcinomatous and sarcomatous tumors may form in the rectum. Hæmorrhoids, due to disease or a weakened condition of the hæmorrhoidal veins, are common, especially in persons who are on their feet a large part of the time and who are engaged in sedentary occupation. Hæmorrhoidal affections may be relieved by astringents or by operation. Polypus of the rectum (soft and hard), comparatively frequent in childhood, is a tumor resembling in shape a berry or a pear and having a peduncle. It sometimes bleeds and protrudes at the anus after stool. It is composed of elongated follicles and a network of small blood-vessels. It may be removed by a ligature or by an appropriate instrument. Prolapsus of the rectum, due to a relaxed state of the sphincter-muscles and the coats of the rectum, may be either incomplete or complete, with protrusion from the anus (prolapsus ani). It is observed generally in young children and women, and is brought on by bearing-down strains. Treatment requires the replacing of the bowel and keeping of it in place, and astringents, caustics and operation are employed as may seem advisable. Stricture of the rectum or narrowing of its calibre may be very limited in extent or may include a considerable portion of it, and is due usually to malignant or syphilitic ulceration. The symptoms include difficult defecation, more or less purulent and bloody discharges and pain. If not relieved, it affects the general health. Treatment consists of dilatation with rectal bougies or division of the cicatricial tissue by instruments (colotomy). Ulceration of the rectum may be due to simple inflammation or to dysentery, tuberculous disease, syphilis or malignant disease. Symptoms vary with the character of the sores and their location. There are usually discharges of pus, blood and mucus, and some pain and tenesmus. Treatment depends on the nature and extent of the disease and the constitutional condition of the patient. It includes the keeping of the bowel as quiet and free from fæcal matter as possible, the use of simple food, saline aperient and vegetable astringents or nitrate of silver. Fissure of the anus or a tear of its mucous membrane may extend into the rectum or a fissure of the rectum may exist by itself. In either case the fissure is usually produced by the passage of hardened fæces and the attendant straining. It is sometimes obstinate. Treatment calls for regulation of the bowels, dilatation and the application of nitrate of silver or other astringent. Neuralgia of the rectum is sometimes mistaken (before an examination of the rectum is made) for fissure. Treatment is as in other neuralgias, except when it is caused by pressure of a displaced coccyx upon sacral nerves. This bone must then be replaced or removed.

Intestinal calculi (enteroliths), gallstones and fæcal concretions containing, it may be, fruit-stones or berry-seeds, are occasionally found in the rectum. They give rise to more or less tenderness and abdominal pain, severe and intractable constipation, cold perspiration, vomiting, thready and rapid pulse, etc., and they must be removed. Invagination or intussusception of the rectum, of the upper portion into the lower, as the result of strain and weakened rectal walls, requires surgical aid.

Regular and free movements of the bowels, unattended by straining, are of the greatest importance in the treatment of most rectal ailments and preventive of many. The fact that the lower portion of the rectum is capable of holding a large amount of hardened fæcal material, while the more liquid matter readily flows by it and out of the body, is not generally understood. Consult Lynch, J. M., 'Diseases of the Rectum and Colon' (Philadelphia 1914) and 'Reference Handbook of the Medical Sciences' (New York 1916).

**RECURRING SERIES.** See SERIES.

**RECUSANTS**, rĕk'ū-zants or rē-kū'zants, a term in use under the penal laws of England, when it was sought to force the consciences of the people by legal punishments. Recusants were those persons who refused or neglected to attend divine service on Sundays or holydays in the Established Church or to worship according to its forms. The word is first met with in temporal courts in the first year of Queen Elizabeth, when it was enacted that all persons who, without reasonable excuse, failed to attend some usual place of prayer, should be censured and fined for every offense 12 pence. In 23 Elizabeth the fine was made for every month

£20, and later in the same reign it was enacted that if recusants did not submit within three months after conviction they might, upon the requisition of four justices of the peace, be compelled to abjure and renounce the realm, and if they did not depart or if they returned without due license, they were to be treated as felons, and suffer death without benefit of clergy. In the case of Roman Catholic recusants the laws were more severe. They were liable to a forfeit of 100 marks (£66 13*s.* 4*d.*) for hearing mass; for saying it the fine was doubled and in both cases they had to undergo a year's imprisonment. They were disabled from taking lands either by descent or purchase after the age of 18, unless they renounced their errors, and could not keep or teach schools under pain of perpetual imprisonment. After a first conviction they could not keep arms in their houses, could not appear within 10 miles of London, could not travel five miles from home without license, could not hold any public office, could not have marriage, baptism or burial performed, except by a minister of the Established Church; could not bring any action at law or equity, all under penalties of fine and imprisonment. By the Toleration Act (1 William and Mary, ch. 18) all persons dissenting from the English Church, except Roman Catholics and anti-Trinitarians, were allowed to meet for purposes of worship according to their own forms on taking the oaths of allegiance and supremacy. The act was extended to include Unitarians in 1813 and in 1829 the Catholic Emancipation Act granted toleration to Roman Catholics.

**RED,** one of the three primary colors. Mixed in equal strength and proportion with the other primaries, it yields secondaries, for example, with yellow it forms orange; with blue, violet, etc. Also a pigment. The most useful red pigments are carmine, vermilion (sulphuret of mercury), chrome-red, scarlet-lake (biniodide of mercury), madder-lake, light red, burnt sienna; these are yellow reds. Venetian red, Indian red (carbonate of oxide of iron) and crimson-lake are blue reds. Red pigments are derived from the three kingdoms of nature, viz.: carmine from the cochineal insect, the lakes and madders from the vegetable world and the others from the mineral world.

**RED ADMIRAL,** a butterfly of the genus *Vanessa,* especially *V. Atalanta,* so-called by British collectors. See ADMIRAL.

**RED-BACKED MOUSE,** a small, chestnut-backed wood-mouse (*Evotomys gapperi*) closely related to the meadow-mouse (*Arvicola riparius*), which is common throughout the eastern half of the United States and in the Saint Lawrence Valley and has the general habits of a meadow-mouse.

**RED-BACKED SANDPIPER,** the dunlin (q.v.).

**RED BANK,** N. J., town in Monmouth County, on the Shrewsbury River, at the head of navigation, and on the Central of New Jersey, the New Jersey Southern and the Pennsylvania railroads about 25 miles south of New York. It has regular steamer connection with New York, Atlantic Highlands and other ports. Settlements were made in the vicinity in 1650, by English and Dutch colonists. It was incorporated as a town in 1872. It is an attractive residential town and a favorite summer resort. It has a number of industrial establishments, chief of which are a large canning factory, carriage shops, clothing factory, boiler works, gold-beating works and brush factory. About 500 persons are employed in the factories. The trade is chiefly in manufactures, farm products and fruit. It has nine churches. The educational institutions are the Shrewsbury Academy, several private schools, a high school which cost $60,000, public and parish schools and a public school library. The government is vested in a board of commissioners of five members, elected annually. Pop. (1890) 4,145; (1900) 5,428; (1910) 7,398; (1915, State census) 8,631; (1920) 9,251.

**RED BAT,** a small reddish bat (*Lasiurus boreales*) common in the temperate parts of North America; length about two inches; fur long and silky, generally light russet, tinged with yellow, darker and richer on the back. See BAT.

**RED-BELLIED HAWK.** See RED-SHOULDERED HAWK.

**RED-BELLIED SNAKE,** a harmless snake (*Storeria occipitomaculata*) of the Eastern United States, whose belly is salmon red. It is dull brown above, with a paler stripe along the spine, bordered by one or more rows of blackish dots; a constant feature is three pale reddish blotches on the occiput. Its size and habits are similar to those of the garter-snakes. Two or three other species in the West have red bellies and are sometimes locally known by the same name.

**RED BLUFF,** Cal., city and county-seat of Tehama County, 120 miles northeast of Sacramento, on the Sacramento River at the head of navigation, and on the Southern Pacific Railroad. The district produces wheat, lumber and wool, and there are canneries, fruit-drying and packing plants and flour mills. Pop. 3,530.

**RED BOOK,** an English government book containing the names of all persons in the service of the State; also an official publication of the Austro-Hungarian government giving its views on the Austro-Serbian controversy shortly after the opening of the World War in 1914.

**RED-BREASTED, or ROBIN, SNIPE,** a dowitcher (q.v.).

**RED BUG, or COTTON-STAINER.** See COTTON INSECTS.

**RED CEDAR.** See CEDAR.

**RED CLOUD** (MAQ-PE-YAH-LUTA), Sioux Indian chief: b., according to his own testimony, 1822; d. Pine Ridge, S. D., 8 Dec. 1909. He first came into prominence as leader of the Indians in the Fetterman massacre near Fort Phil Kearny, Wyoming, in December 1866. In this event 100 men under Captain Fetterman and Lieutenant Brown, comprising the entire command, were slain. Red Cloud then became the acknowledged leader of the warrior Sioux, established a military dictatorship and terrorized the region over which he ruled. He was a much more powerful leader than the somewhat famous Sitting Bull, though he was not a hereditary chief, but rose to distinction through his inborn qualities. In 1874 the Indians abandoned the North Platte country and went to the Red Cloud Agency on the White Earth River, whence they continued under Red Cloud to make frequent raids. In 1880 he made a treaty of peace with the government which he faithfully observed.

**RED CLOUD,** Neb., precinct and city, county-seat of Webster County, on the Republican River and on the Chicago, Burlington and Quincy Railroad, about 110 miles in direct line southwest of Lincoln. It is in an agricultural and stock-raising region. The chief manufacturing establishments are flour mills and machine shops. It has large lumber and stockyards and grain elevators. Its chief shipments are livestock, wheat, corn, vegetables and flour. Pop. precinct, 2,329; city, 1,856.

**RED CROSS, Order of the Royal.** 1. A decoration instituted by Queen Victoria, 23 April 1883, to be conferred on women, not necessarily British subjects, rendering distinguished service in the care of sick and wounded soldiers and sailors. The badge is a cross of enameled crimson edged with gold, bearing the words Hope, Faith and Charity and the date on the arms. The centre has a gold circle with the queen's effigy in relief. 2. A Russian Order of the Red Cross was instituted in 1878 and conferred by the empress upon women.

**RED CROSS SOCIETIES,** a general name for those societies founded for assisting the wounded in time of war, so named because their distinctive badge is a red cross on a white ground. Such societies have been established in all civilized countries as a result of an international conference held at Geneva in 1863, which was followed next year by an international convention agreed upon at the same place, at which the International Treaty of Geneva was accepted and signed by a number of different nations. According to this all hospitals and hospital officials and all in any way engaged in attending the sick and wounded in war are treated as neutral parties. The society in England has four branches, two ambulance branches, one volunteer nursing branch and one branch to raise funds and supplies, and societies in other countries. There is an international committee at Geneva which serves as a centre of communication between the different Red Cross societies throughout the world. In connection with this may be mentioned the decoration of the Royal Red Cross instituted by Queen Victoria in 1883, as a reward for women who have exerted themselves in aid of sick and wounded soldiers and sailors in time of war. The enameled crimson-and-gold cross bears the words «Faith, Hope and Charity,» with the effigy of her majesty, the royal and imperial cipher, etc., and is attached to a blue ribbon and worn on the left shoulder.

The first war to bring the Red Cross service into activity was that of 1866 in Germany, Austria and Italy. Austria had not yet joined the compact, but her citizens raised and gave to the service almost $500,000. Germany's societies supplied over $3,000,000 and 500 volunteers, men and women, entered the service. The Red Cross work during the war proved the incalculable value of the organization. The next call on the service was the Franco-Prussian War. In Germany more than 2,000 committees were formed at the beginning of the conflict, with a central committee at Berlin. More than $14,000,000 was raised and used. France had less resource in readiness, but she raised and used nearly $2,000,000, and her service cared for more than 100,000 wounded men. The next demand on the Red Cross was in 1876–78, when Turkey, Serbia, Montenegro, Greece and Russia became embroiled. In the beginning of this period of its work the Red Cross service was regarded with suspicion by the military, but was soon solicited to take control of its treaty-province. It raised almost $17,000,000 and applied over $13,000,000.

The Red Cross emblem found its first opposing force in Turkey. The Turkish soldiers regarded it as of religious significance and so violent was their prejudice that a red crescent was substituted in order to secure speediest recognition and co-operation. In the Japanese army the Red Cross service has been wonderfully effective. In 1886 Japan entered into this international treaty, and the mikado became president of a Red Cross Society in a civil capacity. In the Turko-Russian contest, in the Tunisian, the Tonkin and the Madagascar wars, the Red Cross was notably active. In the Græco-Turkish campaigns its work and sacrifice were heroic.

**National Red Cross.**— This is an American body incorporated under the laws of the District of Columbia, 1 Oct. 1881, reincorporated 17 April 1893, and reincorporated by act of Congress June 1900; for the relief of suffering by war, pestilence, famine, flood, fires and other calamities of sufficient magnitude to be deemed national in extent. The organization acts under the Geneva Treaty. The United States gave its adhesion by act of Congress 1 March 1882; ratified by the Congress of Berne 9 June 1882; proclaimed by President Arthur 26 July 1882; headquarters, Washington, D. C. The introduction and development of the Red Cross movement in the United States were chiefly due to Miss Clara Barton, the founder of the American branch. Previous to the organization of this branch there were many members of the Red Cross Society in the United States with Miss Barton as their representative. When the national branch was regularly formed Miss Barton was chosen leader. In the United States no laws have been passed to regulate Red Cross work. The national branch has no sub-societies or sub-committees; but patriotic and sympathetic men and women as individuals, or united in societies, are at liberty to assist and to co-operate with the Red Cross in raising money and in providing nurses and whatever the service requires. Whenever needed, this co-operation is active in every State and in most of the Territories.

The American National Red Cross did relief work in the Russian famine of 1892, and in Armenia in 1896.

The Red Cross work in Cuba during the war, as measured by service and contributions, was phenomenal. The total value of gifts, including cash donations, reached nearly $4,000,000. When peace was declared, there yet remained starvation, sickness, disease, destitution, and desolation on the island. The Red Cross continued indefatigable in its work. In all its Cuban undertakings volunteer assistance and contributions of supplies were received from France, England, Belgium, Holland, Switzerland, Germany, Italy, Denmark and Mexico. The American National Red Cross also rendered efficient aid after the following disasters: Johnstown flood, 1889; Galveston flood, 1900; San Francisco earthquake and fire, 1906; Cherry Mine disaster, 1909; Chinese famine, 1910; Italian earthquake, 1908; Minnesota forest fires, 1910; Luzon eruption, 1911; Triangle waist factory fire, 1911; Titanic sinking, 1912; Mississippi flood, 1912; Ohio flood, 1912; Salem (Mass.) fire, 1914; Eastland disaster, 1915; Indiana cyclone, 1917, and many minor casualties. In the Mexican guerrila warfare and the Balkan Wars the society was also active as well as in Manchuria, in the pneumonic plague.

**National Support.**— The governments of the United States, Great Britain, Germany and Italy give no regular financial support to the Red Cross societies. In 1882 Congress appropriated $1,000 for printing Red Cross literature; and since then, from time to time, has appropriated various sums for special purposes. Before the war, in Germany the government granted the society permission to hold occasional lotteries to secure funds. France allowed an indemnity of 20 cents a day for each sick or wounded soldier cared for by the society in time of war. The Netherlands government paid the salary of the secretary, provided office quarters, allowed $400 a year for office expenses, paid the traveling expenses of an officer whose duties in connection with the work of the society may necessitate his leaving his home. Belgium gave financial support in time of war. Denmark contributed annually $1,000. Austria gave $2,400 annually for assistance in case of epidemics or great calamities. Switzerland appropriated $5,000 annually for a special purpose. The emperor and empress of Japan gave annually $1,250. Russia paid for men taken care of by the society in time of war, at a rate agreed upon with the minister of war. In 1900 the emperor sanctioned a tax of two and one-half cents on certain railroad tickets and $2.50 on passports, such extra tax to be for the benefit of the Red Cross Society. The membership of the society just before the war was approximately as follows: In the United States, 298 members of the National Society; France, 55,000; Austria, 52,209; Hungary, 42,041; Japan, 894,814; Germany, main branch and affiliated societies, 300,000.

The American Red Cross has experienced a tremendous development growing out of the World War. In May 1917, President Wilson, as the head of the organization, appointed a war council to supervise its activities. The members were Henry P. Davidson (of J. P. Morgan and Company), Charles D. Norton, Cornelius N. Bliss, Jr., and Grayson M. P. Murphy of New York; and John D. Ryan, of Butte, Mont.; also (ex officio) William Howard Taft and Eliot Wadsworth (chairman and vice-chairman of the executive committee). By proclamation the President made the week of June 18–25 the period for a nation-wide campaign for funds, and this resulted in the raising of over $100,000,000 for Red Cross work. During the five months, May to October inclusive, the membership rose from less than 500,000 to 5,000,000, and the number of chapters from 582 to 2,736. Arrangement was made by which the medical department of the army gave rank to leading Red Cross officials as follows: Chairmen of central committees and war council were created major-generals; members of the war council were made brigadier-generals; the director-general was commissioned a colonel, and his assistant and the commissioner, lieutenant-colonels; while the various Red Cross directors were assimilated as majors. Harvey D. Gibson, president of the Liberty National Bank of New York, was named as general manager of the Red Cross at Washington, with colonels under him as director-generals of the various activities. The chapters throughout the country were gathered into 14 divisions, under division managers: New England, office Boston; Atlantic, office New York; Pennsylvania, office Philadelphia; Potomac, office Washington; Southern, office Atlanta; Lake, office Cleveland; Central, office Chicago; Gulf, office New Orleans; South-western, office Saint Louis; Northern, office Minneapolis; Mountain, office Denver; North-western, office Seattle; Pacific, office San Francisco; Insular and Foreign, office Washington, D. C.

The workers in the chapters manufactured surgical dressings, hospital supplies, knitted garments and comfort kits. Through the bureau of supplies they received their materials at cost. The war council and most of the important positions commanded no salaries; all time was given free, except routine workers, many of whom received small salaries to provide their living. The individual chapters each delivered their productions to the warehouse of their division. Major Grayson M. P. Murphy was one of the first to reach France, where he established American Red Cross headquarters in Paris, and made the arrangements to serve the American troops. He was made a member of General Pershing's staff to facilitate his work. A program was laid out to work in harmony with the Young Men's Christian Association, which also had headquarters in France. Hospital units were systematically organized, with a minimum personnel of 241, and mustered into the United States Army Medical Corps. Each unit was designed to serve at least 500 patients. Nearly 50 such hospital units had been organized by 1 Jan. 1918. This quick work would have been impossible, had it not been laid out and started long before America's entrance into the war. The Red Cross organization is rightfully proud of the fact that within six weeks after the President's declaration that a state of war existed, they had six hospital units ready, which were the first detachments of the American army to join the Allies. Their efforts were by no means confined to caring for American troops. They had a chain of warehouses and motor trucks, that was supplying (Jan. 1918) 3,500 war hospitals in France. They served hot meals to allied soldiers at the railway stations, furnished bathing, disinfecting and resting facilities for the men who had retired from the trenches to recuperate, and did an immense amount of useful service. Especially did they care for refugees and mutilated soldiers. They housed the refugees who came in, looked after their health and started them in the work of rebuilding destroyed villages and the like. These activities were of course handled in co-operation with the French government, so that the work was harmonious with their own. Special efforts were also put forth to aid orphans, lost children and babies for whom support was not provided. Because of the distressingly low French birthrate, and increased mortality, this work was of importance, and three groups of children's specialists were formed, a part of whose duties was to aid prospective mothers, and to make healthy children of the babies that were born. The German government shipped out of their lines practically all of the inefficient French population, and most of these found their way back to France via Switzerland. The American Red Cross helped an immense number of refugees, and carried on this work until a considerable time after the close of the war. They established a vast system for bringing in not only hospital supplies, but clothing and food. The shipping board co-operated to assist them, and they sent supplies and medical relief to nearly all the Allies, except Great Britain. Most of the cargo space for these supplies was donated by the steamship companies, army transports accommodated them and passenger rates for Red Cross workers were placed at the lowest possible figure.

The total American Red Cross war appropriations in France up to 15 Oct. 1917 was a little over $15,000,000, and in other European countries nearly $4,000,000, while the United States work had cost nearly $8,000,000. Of this Russia got $323,000, Roumania $247,000, Italy $210,000, Serbia $223,000, England $17,000, Armenia $638,000, Belgium about $300,000. The sums appropriated to these countries by the close of 1917 were about double these amounts. By arrangement with Germany the Red Cross shipped food supplies regularly to Allied prisoners in German territory and 95 per cent of these were properly receipted for by the prisoners of war themselves. It is believed that the principal dependence of many of these prisoners for food, as well as small change, was on the «every fifth day» shipments of the Red Cross.

In the training camps for soldiers in the United States the Red Cross was also active, maintaining a bureau of sanitary service, and looking after their comfort and welfare in a hundred minor ways. Ambulance corps were provided as fast as called for, and the hospital work was efficient. There is a great corps of home workers in the Red Cross, and a part of their activities consisted in looking after soldiers' families, who for any reason were improperly provided for. At the personal request of President Wilson, the Red Cross entered into co-operative arrangements with various other relief societies, to avoid duplications and omissions of service. Among these were the National Surgical Dressing Committee, the Needlework Guild of America, the War Service League of the Salvation Army, the American Fund for French Wounded, the American Committee for the Relief of French War Orphans, and in France the American War Relief Clearing House, American Distribution Service and Les Tuberculeux de la-Guerre.

Consult 'Red Cross Society in Foreign Countries,' Senate document No. 178 (1903–04); Du Camp, 'La Croix-Rouge de France'; Criegen, Das Rothe Kreutze in Deutschland'; Barton, C., 'The Red Cross' (1898); Boardman, 'Under the Red Cross Flag' (1915); Billington, M. F., 'The Red Cross in War' (1914), quarterely bulletin published by the International Committee of Geneva, 'Bulletin International des Sociétes de la Croix-Rouge'; 'Memorial des Vingt-cinq premières années de la Croix-Rouge,' and American Red Cross Relief Reports (New York).

**RED DEER,** or **STAG,** the common deer (*Cervus elephas*) of Europe and western Asia, which is typical of the family, and the ordinary «deer» of literature and poetry as well as of the chase. It much resembles the American wapiti, but is smaller and rather darker in general color. A fine specimen will stand four feet tall at the fore-shoulder and will weigh about 300 pounds, but exceptional ones have weighed much more. Even larger are those of the Asiatic border and Asia Minor. The antlers of Scotch and Irish stags rarely exceed 33 inches in length; but those of eastern Europe and Siberia are far longer. Several different names have been given to the related deer of northern Asia, but they seem to be essentially the same as those of Europe, where they survive sparsely and under legal protection in almost all the countries. In the British islands the wild red deer remains only in the Highlands of Scotland, but is «preserved» on many large estates and protected moors in both England and Ireland. The species is supposed to have been originally introduced into England from France, where it became very numerous, but since the 17th century it has been killed off in most parts of that kingdom to make way for the fallow deer, the venison of which is far superior, and the animal itself of a more manageable and placid disposition.

The stag has a fine eye, an acute sense of smell and a good ear. When listening, he raises his head and erects his ears. When going into a coppice or other half-covered place, he stops to look round him on all sides, and scents the wind, to discover if any object be near that might disturb him. Though a simple, he is a curious and crafty animal. When hissed or called to from a distance, he stops short, and looks steadfastly, and, with a kind of admiration, at horses or men; and if the latter have neither arms nor dogs he moves on without betraying any symptoms of alarm. He eats slowly; and after his stomach is full, he lies down and ruminates at leisure.

In winter and spring this animal rarely ever drinks, the dews and tender herbage being sufficient to satisfy his thirst; but during the parching heats of summer, he not only frequents the brooks and springs, but searches for deep water wherein to bathe and refresh himself. He swims with great ease and strength, particularly when he is in good condition, his fat contributing to his buoyancy. His voice is stronger, louder and more tremulous in proportion as he advances in age; and during the rutting season it is really fearful. The cry of the hind, or female, is not so loud as that of the male. The pairing season is in August; the time of gestation is between eight and nine months; and she seldom produces more than one at a time. The usual season of parturition is about May, and at that season the hinds are very cunning in concealing and tending, and exceedingly courageous in defending their young, which are exposed to many enemies. The «calf» (as the fawn is called by gamekeepers) never quits the dam during the whole summer; and in winter, the hind, together with all the males under a year old, assemble in herds, which are more or less numerous in proportion to the mildness or severity of the season. At the approach of spring they separate, none but those of the age of one year remaining associated. Stag-hunting, as carried on in the Highlands, is a sport capable of rousing all the manly ardor and energy of youth and manhood. The beauty, graceful and magnificient bearing of the animal, his sagacity in evading the stratagems of the hunter, or deer stalker, and his courage when at bay, add greatly to the pleasure of the chase. When the stag stands at bay, his effort is to do so in a river or lake, where he has a great advantage over the dogs, for he firmly stands and holds his position, whilst they swim powerless around him. On land, even, a stag at bay has great advantage over the hounds, who exhaust themselves with their clamor, while he is in a comparative state of rest, and recovers his wind. In stalking deer, the animal is generally shot; but if he is only wounded, and has power to fly, then the dogs are slipped to the pursuit. But, in olden times, the chief reliance for pulling and killing the deer was in the dogs; and the fleetness and courage of their hounds were the pride of nobles and kings.

At the present day another sort of stag hunting takes place near Windsor Castle and in some other parts of England. In this sport, which is contemptuously regarded by many persons, a captive stag is carried in a covered cart to the place where the chase is to occur and then turned loose. After brief interval, called giving the deer «law,» a pack of hounds is sent upon his trail, and if the stag has spirit enough to run, the hunters following on horseback have a lively chase across the country, at the end of which the deer is retaken, unharmed if possible and saved to run another day. This is a rather tame tradition of the ancient sport.

From the most remote periods, the stag has been the favorite object of the chase; and the severe forest laws of the earlier Norman monarchs sufficiently attest the importance which they attached to the sport. The afforesting of vast tracts of country, by which not only single cottages were destroyed, but whole villages swept away, and churches desecrated and demolished, was the fertile source of misery to the poorer inhabitants, and of injustice to the ancient proprietors of the soil; and the cruel inflictions of the oppressive laws which were enacted to preserve the deer, increased tenfold the curse arising from this tyrannical passion for the chase,— for it was a crime less severely penal to kill a man than to destroy or take a deer.

The ancient customs and laws of ‹Venerie,› that science which our simple ancestors looked upon as one of the first accomplishments of the high-bred noble, and a knowledge of which was essential to his education, were formal and technical to an extreme degree. A few of the terms, betokening the different ages of the stag and hind, are still retained, though somewhat altered. The young of either sex is called a «calf»; after a few months the male becomes distinguished by the growth of the bossets, or frontal protuberances, on which the horns are afterward developed, which during the first year are merely rounded knobs, whence he takes the name «knobber.» In the second year they are longer and pointed, and are called dags, and the animal has now the name of «brocket.» In the third year, the first, or brow antler, has made its appearance, and the deer becomes a «spayed.» In the fourth, the bez-antler is added, and he is then termed a «staggard.» He is a «stag» in the fifth year, when the third antler, or royal, appears; and in the sixth, the commencement of the sur-royal, or crown is formed, when he takes the name of «hart,» which name he retains through life. At this time he is called a «stag of ten,» probably because the branches, including the sur-royal, frequently amount to that number. After the seventh year he is said to be croched, or palmed, or crowned, according to the number of branches composing the sur-royal. The female is a «calf» in the first year, a «brocket's sister» in the second and third, and ever afterward, a «hind.»

See DEER, and consult authorities there cited.

**RED EAGLE, Order of the.** See ORDERS, ROYAL.

**RED-EYED VIREO.** See VIREOS.

**RED GAME, or GROUSE.** See GROUSE.

**RED GUM-TREE,** one of the Australian Eucalypti (*Eucalyptus resinifera*), yielding a gum-resin valued for medicinal uses. (See EUCALYPTUS). Also the North American liquidambar (q.v.).

**RED HORSE,** a fish. See SUCKER.

**RED JACKET,** American Indian, chief of the Senecas: b. Old Castle on Seneca Lake, about 1751; d. Seneca Reservation, 30 Jan. 1830. His Indian name was Sagoyewatha; he was called Red Jacket on account of the scarlet jacket he always wore, which had been given him by a British officer. He was one of his tribe who served with the British during the Revolutionary War; and was noted as an orator. He became widely known through his attitude toward the treaty of Fort Stanwix in 1784; a council had been called to negotiate between the United States and the Six Nations for the cession of lands, and on the occasion he spoke eloquently against the proposed treaty, but without avail. It was shortly after this that he was elected chief of the Senecas. In 1792 on the occasion of the signing of a treaty of peace between the United States and the Six Nations, Red Jacket had an interview with General Washington, who gave him a silver medal which he always wore afterward. In 1810 he gave information to the agent of the government of the attempt made by Tecumseh to draw the Senecas into the western combination; and in the war with England of 1812 he offered the service of his tribe to the United States, and proved his bravery in several skirmishes. The latter years of his life were passed on the Seneca Reservation; he became very intemperate, and was at one time deposed from the chieftainship on that account. He always opposed the advance of civilization, the missionaries and the work of education among his people. Consult the ‹Life› by W. L. Stone.

**RED JACKET,** Mich., village in Houghton County, on the Chicago, Milwaukee and Saint Paul, the Chicago and Northwestern, the Mineral Range and the Copper Range railroads, about 15 miles north of Houghton. It is in the famous copper region in northern Michigan, near Lake Superior. Its industries are connected with the mining of copper and preparing it for market. Pop. (est.) 4,700.

**RED-LETTER DAY,** in the Roman Catholic Church days set apart for especially important festivals, and so named because of being indicated in red letters in the old missals and breviaries. Formerly they were so indicated in the calendar of days in the Book of Common Prayer, and some prayer-books are still printed in this fashion. In general usage the term has come to mean especially fortunate or auspicious days in a person's life, or days to be remembered because of some important event or benefit.

**RED LINE MAP,** a map which attracted considerable interest about the time of the dispute between the United States and England over the boundary line between Canada and Maine. It was made by the Frenchman D'Anville in 1746. It had been sent to Vergennes, the French minister, by Franklin in 1782, and was discovered among the Paris archives by Jared Sparks. A strong red line drawn near the ridge, in which the Kennebec and Penobscot rivers rise, more than favored the English claims, respecting the northeast boundary of the United States. Sparks sent it to Webster, then Secretary of State, who was anxious lest the English should hear of it. It was used in a secret session of the Senate, and with the Maine commissioners to induce a ratification of the treaty, and was afterward made a ground of reproach against Webster by opponents of the treaty.

**RED LODGE,** Mont., city and county-seat of Carbon County, 170 miles southeast of Helena, on the Northern Pacific Railroad. It is situated in a district with deposits of coal, gold and silver; and farming and stock-raising are also carried on. The city's chief business is as a shipping centre. Altitude, 5,500 feet. Pop. 4,860.

**RED MEN, Improved Order of.** See IMPROVED ORDER OF RED MEN.

**RED OAK,** Iowa, city, county-seat of Montgomery County, on the Nishnabatona River, and on the Chicago, Burlington and Quincy Railroad, about 48 miles southeast of Council Bluff and 38 miles east of the Missouri River. It was founded in 1857. It is in a fertile agricultural and stock-raising region; and its industries are connected chiefly with farm products. The chief industrial establishments are flour mills, machine shops, creameries, lumber and brick yards, and stock yards. The city has 13 churches, six schoolhouses, county courthouse, municipal buildings, and several good business blocks. The three banks have a combined capital of $200,000. Pop. (1920) 5,578.

**RED RIDING HOOD, Little,** a popular nursery story of a little girl going to visit her grandmother and being eaten by a wolf disguised as the grandmother whom he had previously devoured. The story has many versions, but that of Perrault, ‘Le petit chaperon’ in ‘Contes du temps passé’ (1677) forms the base for most of them. The brothers Grimm use the tale but in their version Red Riding Hood is rescued through the timely arrival of some woodsmen who cut open the wolf and release her.

**RED RIVER,** a large river of the United States, the southernmost of the great tributaries of the Mississippi River. Its headwaters are in the northwestern part of Texas, on the eastern edge of the Llano Estacado, and it flows east-southeast, forming the boundary between Texas and the Indian Territory and the northeastern boundary of Texas, entering Arkansas at the southwest corner of the State. After entering Arkansas it turns south and pursues an exceedingly irregular course to Shreveport, La., where it again takes a southeast course to Avoyelles County, making a large northern curve in crossing this county, and entering the Mississippi River opposite the southwest corner of the State of Mississippi. The mouth of the Red River is about 340 miles from the mouth of the Mississippi River. The whole course is nearly 2,000 miles. The chief tributaries are the Washita, which joins it in Louisiana; and the False Washita and the Kiamich, both of which it receives in the Indian Territory. Much of its course is through rich prairies, with red soil which colors the water. About 100 miles above Natchitoches, which lies 100 miles above the mouth of the stream, commences a swampy expansion of the river called the Raft, 70 miles long and 20 miles to 30 miles wide, produced by the river dividing into a number of channels, sometimes shallow, which have been obstructed by fallen trees and other matter brought down by the stream. At great expense this obstruction has been cleared away so far as to admit the passage of steamboats. About four miles above Natchitoches the various channels again unite, soon, however, again to separate into numerous creeks and bayous. Above Shreveport was another such Raft, about 32 miles in length. In 1873 a channel was cut through, making this part of the river navigable, but constant care is exercised in removing the floating timber so as to keep the stream open. In the upper part of its course it flows through lofty cañons whose perpendicular sides are from 300 to 800 feet in height. After leaving the cañons it enters the sandy lands, where the waters extend out to a shallow stream from 500 to 3,000 feet in width. Then as it enters the wooded country the stream becomes sluggish and spreads out for miles.

A peculiarity of the lower course of the river is the bayous which it sends out. Some of the bayous return to the main stream and others flow directly to the Gulf of Mexico. The Atchafalaya River originally left the Mississippi at a great bend below the mouth of the Red River; but the Mississippi has cut across the bend, forming Turnbull Island, and here the Red occupies the channel once the Mississippi, and flows south of the island, so that the head of the Atchafalaya is now in the Red River, from which it flows south to the Gulf. The Mississippi receives the flood much earlier than the Red River, and at that time, the Mississippi floodwaters flow back past Turnbull Island and down the Atchafalaya. The floodplain of the Red River in Louisiana extends along the river until it is merged into the floodplain of the Mississippi at the mouth of the Black River. This plain is from 10 to 20 miles wide and is known as the Red River bottoms. The plain is below the level of the river and is protected by levees. The river bed above Natchitoches has changed. Many years ago the river left the old bed and cut a new way for itself, a channel about 20 miles long. The new channel is called Bon Dieu River and the old channel is called Cane River. The government is improving the navigation of the Red River and engineers have worked to force all the waters of the Red River into the Mississippi; thus cutting off Atchafalaya. The river is navigable for nearly 1,300 miles and with its tributaries, over 2,000 miles. Small steamers can ascend almost to the Texas boundary at high water and to Shreveport at all seasons except when the water is very low. Consult Marcy, ‹Exploration of the Red River of Louisiana.›

**RED RIVER, or SONG-KOI,** a river of Tongking, formed by the junction of the Leteën and Song-shai, the former rising in the Yun-nan province of China, the latter in Laos. It flows southeast, passes Hanoi and after a course of about 700 miles falls by several mouths into the Gulf of Tongking. The river is navigable to Lao-kai, on the border of China and Tongking and along it the French have developed a trade with the Chinese.

**RED RIVER CAMPAIGN.** In 1864 General Banks, to reduce Texas, asked for reinforcements in order to take in rear the Confederate works at Galveston and the mouth of the Brazos; but Halleck advised operating by way of the Red River, capturing the Confederate depot and dockyard at Shreveport and repossessing western Louisiana and Texas at a blow. The Mississippi squadron under Porter was to co-operate; the army must be back for the trans-Mississippi operations of spring and summer; but no movement could be made till the spring rains had raised the Red, with only four feet at low water and full of obstructions. The fleet left Vicksburg 10 March and landed A. J. Smith's troops at Simsport on the 13th; General Franklin had already come up and driven Gen. Dick Taylor from Fort De Russey guarding the stream; the fleet passed up without opposition; and on the 15th and 16th the forces met at Alexandria. But the Union movements were difficult of co-ordination; Banks did not arrive till the 26th, the rest of Franklin's corps on the 28th. Meantime the Confederates had strongly fortified Shreveport and placed several gunboats there. Banks, with Franklin, went by land to Natchitoches, routing a Confederate force at Cane River on the 28th; Smith's command went by the river in transports, to Grand Ecore, four miles below, arriving 3 April, the day after Banks. On the 8th and 9th Banks advanced by a road away from the river; the Confederates had laid a V-shaped ambush for him, and his command of 8,000 men was utterly routed and would have been annihilated but for reinforcements from Franklin, 2,000 being killed or wounded (battle of Mansfield); Banks retreated; the next day the Confederates advanced, but were met by a counter-ambush of Franklin's and one wing of their army was driven back with heavy loss. But the other wing was so successful that the Federals retreated that night and hurried on to Grand Ecore and finally to Alexandria, abandoning the campaign. Meantime the fleet was caught in the falling water of the Red and would have fallen into the hands of the Confederates but for the engineering skill and resolution of Lieut.-Col. Joseph Bailey, who built a dam of stones and logs, which raised the river and floated all the vessels down with a narrow escape from destruction.

Banks' army in this campaign numbered 31,303; but after detaching two divisions sent to different points, he had a marching column of 25,736 officers and men of all arms. His losses, including those lost on the retreat from Alexandria, were 454 killed, 2,191 wounded and 2,600 captured or missing, a total of 5,244. Taylor's Confederate army numbered 11,000 and its total losses in the campaign were 3,976 in killed, wounded and missing. See SABINE CROSS ROADS.

JOSEPH T. DERRY,
*Author of ‹History of Georgia.›*

**RED RIVER OF THE NORTH,** a stream which has its source among the lakes in the west central part of Minnesota. It first flows south and southwest, then west to the boundary between Minnesota and North Dakota, where it turns north and forms the boundary between the States mentioned. It enters Canada in the province of Manitoba and flows into Lake Winnipeg. Its source is about 1,600 feet above sea-level and its mouth 710 feet. It is nearly 700 miles long, the greater part of its course is in the United States. Its drainage area is about 43,500 square miles, three-fourths of which is in the United States. It is navigable almost to the source. The river and its tributaries have in many parts of the plain cut channels through the clay from 20 to 30 feet deep. The Red River is connected with the Mississippi through its southern branch, Lake Traverse, and the Minnesota River. At high water small boats can pass from the Red River to the Mississippi. It is connected with Hudson Bay by means of Lake Winnipeg. A number of small rivers enter the Red River from Minnesota and North Dakota. The largest tributaries from North Dakota are Cheyenne and Pembina. The latter river has its rise in Manitoba. The chief tributary it receives in Manitoba is Assiniboine.

The Red River flows through a productive agricultural region, famous for the quantity and quality of its wheat. The greater part of the basin of this river has been twice submerged beneath the sea, and it was covered with an extensive glacial drift which left an immense lake, now called Lake Agassiz (q.v.), that had an outlet to the Mississippi River. The beaches are still well defined, even those showing the gradual contraction of the lake. The lakes of Manitoba are the remains of this vast lake. The deposits made by means of ice and water have made the Red River Valley an exceedingly fertile region.

**RED RIVER SETTLEMENT,** Canada, founded in 1812 by the Earl of Selkirk, on the banks of the Red River, and since 1870 forming part of the province of Manitoba (q.v.).

**RED ROBE, The.** One of the most powerful of the plays of social criticism written by Eugène Brieux is ‹The Red Robe› (‹La Robe rouge›), produced in 1900. It is a scathing indictment of the system of criminal justice peculiar to France. It satirizes the unscrupulous place-hunting of lawyers who, desiring to rise to judgeships, can do so only by pleasing the people and accumulating convictions of the supposedly guilty. If a crime be committed, the police and the prosecutors must find the criminal, or, failing of this, must fasten the deed upon the innocent, in order to satisfy public demand. The ruin of one such innocent victim is depicted, together with the hideous methods of the chief prosecutor for bullying the poor devil and his wife into submission. Eventually the Basque peasant Etchepare is acquitted through the courage of an honest lawyer who revolts against the trickery of his colleagues and thus forever forfeits advancement for himself. But the unhappy Etchepare is already hopelessly injured in property and reputation and his wife, against whom he has been turned by the villainous Mouzon, when the latter laughs at her claim for reparation, slays him with the knife of one of his victims kept as a trophy. Every incident of the plot of this piece, every scene and every personage is contributory to the central thesis of the dramatist, who has elsewhere confessed: «Had I lived in the 17th century I would have been a preacher; but now I write plays.» It should be noted, however, that 'The Red Robe' is far superior in point of structure, characterization and dramatic appeal to such other didactic works of Brieux as 'Damaged Goods' and 'Maternity'; for the dominant idea and purpose are here more artfully embodied in a story that excites emotional interest apart from any doctrine. 'The Red Robe' has been translated in English by F. O. Reed (1915) and A. Bernard Miall (1916) and is discussed in a monograph on Brieux by P. V. Thomas (1913).

FRANK W. CHANDLER.

**RED ROVER, The.** 'The Red Rover,' Fenimore Cooper's second sea tale, was written in France and published early in 1828 at Philadelphia. Cooper felt that in writing of nautical affairs he must take care to avoid the themes and characters preferred by Smollett and so was at some pains to invent all his details «without looking for the smallest aid from traditions or facts.» Actually, his plot follows the romantic mode with fidelity: an imperial-souled hero, wounded in his sensibilities, has long been a successful and splendid pirate under the scarlet flag, but, in spite of his evil deeds, has so much conscience left that he can be converted in a dramatic moment, later to expiate his sins by services to the Revolution. The story itself could not have made 'The Red Rover' one of Cooper's two or three best sea romances, as it undoubtedly is. There must be taken into account also the solid basis of reality exhibited in the book's seamanship, and, not quite so notably, in such persons as the memorable old tar Dick Fid and the devoted negro Scipio Africanus. The book's representations of life in Newport seem less veracious, pointed even though they are with the author's customary sharpness toward the faults of New England. Fortunately, the action takes place largely at sea and is abundantly varied with chases and storms which succeed each other with exciting speed. What secures to the book, however, its position of excellence is something richly imaginative, something finely poetical, about the conception of the sea which colors the entire narrative. The ocean here plays a great part. It is the voice of the very tumult of nature, which romantically frees men from the narrower limits of existence on land and yet at the same time shapes their characters with a firm and noble discipline.

CARL VAN DOREN.

**RED RUSSIAN.** See RUTHENIANS.

**RED SANDSTONE,** an obsolete term in stratigraphical geology, used to designate a group of formations of which a red sandstone of various shades was characteristic. These sandstones, however, were later found to belong to two series, a lower one, the Old Red Sandstone (q.v.), now generally known as Devonian, and an upper one, the New Red Sandstone (q.v.), separated from each other by the formations of the Carboniferous Period (q.v.).

**RED SCALE,** an insect affecting the orange (q.v.). See also SCALE-INSECTS.

**RED SEA, or ARABIAN GULF** (ancient, *Mare Rubrum, Mare Erythræum,* or *Sinus Arabicus;* Arabic, *Bahr-el-Hejaz*), a branch of the Indian Ocean, extending from the Strait of Bab-el-Mandeb, in a north-northwest direction between Arabia on the east, and Abyssinia, Nubia and Egypt on the west, and connected with the Mediterranean on the north by the canal, about 100 miles long, across the Isthmus of Suez. The Red Sea is a compartively narrow expanse, 1,450 miles long with a maximum breadth on the tropic of Cancer of 200 miles and a general average of about 180 miles, but diminishing gradually at its south and north extremities; at the former, across the strait it has a width of only 14½ miles, further subdivided by the island of Perium into two channels, a larger on the east, of 11 miles, and a less on the west of one and one-half miles, and forking at the latter into two branches, the one of which, forming the Gulf of Akaba, penetrates north by east into Arabia for about 100 miles, with an average breadth of about 15 miles; while the other, forming the Gulf of Suez, follows the general direction of the sea, and penetrates between Arabia and Egypt for about 200 miles, with an average breadth of about 20 miles. In the fork between these two branches is the celebrated Mount Sinai, or Jebel Musa (Mount of Moses). To the biblical student the Red Sea possesses considerable interest, from the account of its miraculous passage by the children of Israel when journeying from Egypt. The place at which they crossed the sea was the Gulf of Suez at its northern extremity, but opinions differ as to the exact point of transit, some maintaining that it was in the neighborhood of the town of Suez, and others that it was about 18 miles farther south, at the mouth of the Wady Tuarik. The marine temperature ranges from 70° to 94° F.

The climate is tropical and depressing; both shores of the Red Sea east and west consist generally of a low tract, mostly sandy, though sometimes swampy, varying in width from 10 to 30 miles, and suddenly terminated by the abutments of a lofty table-land of 3,000 feet to 6,000 feet high. The Red Sea may thus be considered as occupying the bottom of an immense longitudinal valley, which probably at one time extended between the table-lands without interruption, but has since been partially filled up by coral-workings, which, extending in parallel lines at a short distance from either coast, have subdivided the sea into three different channels, and have also studded its shores with numerous small islands. In the main channel the depth reaches in one place 1,200 fathoms, but diminishes toward the extremities, where the depth in general does not exceed from 40 to 50 fathoms; the mean depth may be taken at 375 fathoms.

In the Gulf of Suez, which in earlier times is supposed to have extended considerably farther north, this depth gradually decreases to 30 fathoms, and still continues to shoal, till at the harbor of Suez it amounts to only three fathoms; in the Gulf of Akaba, on the contrary, the depth of the main channel is fully maintained, and in some places even exceeded. The currents of the Red Sea are the result of prevailing winds. These winds, whether proceeding either directly north or south, affect only the main body of the sea, and leave a considerable belt along the coasts subject to alternations of land and sea breezes, and not unfrequently to sudden squalls. The chief dangers to navigation arise from the number of shallow reefs, of the presence of which no intimation is given, as the sea never breaks upon them. This absence of breakers is accounted for by the porous nature of the coral, which offers so little resistance that the sea diffuses through it without commotion, as if it were passing through a sieve. The principal harbors of the Red Sea are, in the African Coast, Suez, Kosseir, Suakin and Massowa; and on the Arabian Coast, Jedda (the port of Mecca), Hodeida and Mocha. The trade from shore to shore is not of much importance, consisting chiefly of the transport of pilgrims and some grain from Egypt; but the trade up and down the sea, between Europe and the East Indies, has become very large since the construction of the great ship canal across the Isthmus of Suez.

A telegraphic cable enters the Red Sea at Suez, passes down to Kosseir on its western shore, thence to Suakin on the same side, about lat. 19° 10′ N., and then proceeds in a south-southeastern direction close to the island of Perim, and out into the Indian Ocean by the Strait of Bab-el-Mandeb, and arrives at Aden (q.v.).

**RED SHIRTS,** the name given to an organization in North Carolina, whose object was to establish and maintain white supremacy in that State and keep the negroes under. It flourished in the reconstruction period after the Civil War. The members wore red shirts.

**RED-SHOULDERED HAWK,** a large American buzzard-hawk (*Buteo lineatus*), known popularly as one of the hen-hawks (q.v.) and common over most of North America; but western examples differ from the eastern ones and are called the red-bellied hawk (variety *elegans*). It is most numerous south of the Great Lakes in winter, by reason of the accession of northern migrants. It is of large size and distinguished by the rufous tinge of the head, neck and shoulders, and plumage generally, the breast with shaft-streaks of blackish and the tail clear brownish-black, crossed with six sharply defined narrow bands of white. The young are darker and more obscurely marked. The habits of this bird are much like those of its congeners, the red-tail and broadwing. They may be seen at all seasons «sweeping in graceful curves over the country, rising and falling in spirals, unless after noting prey, when they sometimes dart down hundreds of yards in a very few seconds. Although they feed much on birds and rabbits and are frequent visitors to the farmyard, they seem to have a special predilection for squirrels.» They make their nests of sticks in the tops of tall trees and very early in the spring four or five large, globular, heavy blotched eggs are laid. Consult Fisher, ‹Hawks and Owls of the United States› (1893).

**RED SNAPPER,** a fish. See SNAPPER.

**RED SNOW,** the color of which is caused by minute organisms, vegetable or animal. Aristotle hinted at its existence; Saussure in 1760 discovered it on the Saint Bernard and Captain Ross in 1819 brought specimens from the Arctic regions. He had found eight miles of cliffs, 600 feet high, colored by it, in many places to the depth of 12 feet, where the rock was reached. Captain Parry and other Arctic explorers have since met with it abundantly.

**RED SPIDER,** a small, scarlet web-spinning mite (*Tetranychus telarius*), which damage the leaves of plants in greenhouses. They should be killed off by a kerosene emulsion spray.

**RED SORREL.** See HIBISCUS.

**RED STONE, Old Fort,** a Pennsylvania structure which figured in the struggle between the French and English for mastery in the Ohio region. It was first a storehouse of the Ohio Company, was a rendezvous for the English when they gathered to advance against the French in 1754 and was burned by the French later in the conflict. At its ruins the leaders of the Whisky Insurrection held a meeting in August 1794 to plan opposition to the Whisky tax.

**RED SUNSETS,** brilliant phenomena which attracted attention in North America and other parts of the globe in the autumn of 1883 and for several succeeding months. A vivid red glow suffused the entire western sky, remaining for upward of an hour, when it would slowly fade away. This strange sight was first noticed in India, where, it is said, the sun assumed a distinct greenish tinge on nearing the horizon. In striving to account for these strange manifestations a number of solutions were offered, but the theory that met with greatest acceptance was that they emanated from volcanic dust and gaseous matter vomited by Krakatoa, in Sunda Straits. Calculations demonstrated the fact that the manifestations of the red glow coincided with the course which such vapors would take on being wafted away by winds.

**RED TAPE,** a term applied to unnecessary routine and formality in official affairs. It is derived from the fact that official documents were bound together by red ribbons or tapes. Dickens in ‹Little Dorrit,› and Mark Twain, in one of his humorous sketches, have illustrated the working of red tape.

**RED WATER,** (1) a disease of cattle. See RINDERPEST. (2) A marine worm of flagellate protozoa, class *Mastigophora*, order *Dino-*

*flagellata,* infecting harbor waters, destroying fish and mollusks. Varies in color from yellow to reddish brown and is so called as it turns the water red when present.

**RED WING,** Minn., city, county-seat of Goodhue County, on the Mississippi River, at the head of Lake Pepin, and on the Chicago, Great Western, the Chicago, Milwaukee and Saint Paul and the Chicago and Northwestern railroads, about 40 miles southeast of Saint Paul. It was settled in 1853, incorporated in 1854 and chartered in 1864. It is in a productive agricultural region in which are deposits of fire-clay. Red Wing is the commercial and industrial centre for a large part of Goodhue and Dakota counties. The chief manufacturing establishments are sewer-pipe works which employ about 450 persons; furniture factories, about 250 employees; stoneware works, 120; other manufactories, with about 130 employees. The prominent public buildings are the churches, schools and several business blocks. The educational institutions are a State training school, Red Wing Seminary, Hague Synod Theological School, Lutheran Ladies' Seminary, high school, public and parish schools, a public library, and private school libraries. There are two hospitals. The three banks have a combined capital and surplus of $730,000. The government is vested in a mayor and a council of nine members, elected biennially. Pop. (1920) 8,637.

**REDAN,** a fortified work having two faces forming a salient angle in the direction from which an attack may be expected. It is open at the gorge. A double redan has a reentering angle for mutual defense. The redan is the simplest field work, and is used for defending the avenues of approach to a village, bridge or defile. In front of another field work, it is called a flèche. When flanks are added to the faces, the work becomes a detached bastion or lunette. The redan at Sebastopol in the Crimean War was the scene of stubborn conflict between the Russians and the English.

**REDBIRD.** See Cardinal Grosbeak.

**REDBREAST, or ROBIN REDBREAST,** a familiar European warbler (*Erythacus rubecula*), which by its familiar habits has endeared itself to children, and has caused it to be protected and welcomed more than any other bird. The red breast of the male is the distinguishing feature of the species, but the females have duller colors. In Great Britain the redbreast is a permanent resident, but in more northern countries it is migratory, flying southward in winter. It also occurs in Asia Minor and in North Africa. The nest is made of moss and leaves, and is lined internally with feathers. The eggs number five or six, and are white, spotted with pale brown.

These birds, in winter especially, become very bold and confident in habits, approaching doors and windows without fear, and soon learning even to know the hand which deals out crumbs and scraps of food to them during the inclement season. On the approach of the milder spring the redbreast returns to its native haunts and wilder state. During the breeding season these birds are very pugnacious and they may attack and drive away all the smaller birds from the vicinity of the nest. The food in spring consists chiefly of insects, while in autumn fruits and seeds constitute the dietary. The song is sweet, but not specially remarkable, and continues during spring, summer and autumn, often in rainy weather. In Germany it is termed *Thomas Gierdet;* and in Norway, *Peter Ronsmad.*

**REDBUCK.** See Duiker-bok.

**REDBUD,** a tree. See Cercis.

**REDCAP,** a variety of Hamburg fowls. See Poultry.

**REDDING,** Cal., city, county-seat of Shasta County, on the Sacramento River and on the Southern Pacific Railroad, about 172 miles north of Sacramento. It is in a mining and lumbering region, in which there are some excellent farms in the fertile valleys. The chief industrial establishments are lumber mills, machine shops, foundries and tool shops. The shipment trade is chiefly in lumber and minerals. It has a well-built courthouse and a sanatorium. Pop. 3,090.

**REDDLE,** a red ochre or red chalk occurring in Arkansas but not yet utilized.

**REDEMPTION,** *in Christian theology,* the liberation of sinners from the penalties of the violated divine law; it is effected through the expiating vicarious sacrifice of Christ upon the cross. *In law,* the freeing of an estate from mortgage, or the taking back of mortgaged property upon fulfilling the terms or conditions on which it was conveyed to the mortgagee. See Equity of Redemption.

**REDEMPTIONERS, or INDENTURED SERVANTS,** emigrants to the American colonies who sold their services to planters or others for a term of years — four, five or seven, according to the contract — after the completion of which they acquired their liberty with a grant of land. There were redemptioners in the first colony founded in Virginia; the system was introduced in Massachusetts in 1631 and later in Maryland, New York, Connecticut and Pennsylvania. With these indentured servants were brought in many persons who came not of their free will but were kidnapped and held in servitude. See Villeins.

**REDEMPTIONISTS.** Under the name Trinitarians, a monastic order founded in the year 1197 by Pope Innocent III for the ransom of Christians captured by the Moors and the Saracens. John de Matha (d. 1213) and Felix de Valois (d. 1212) were the leaders of the order, the former becoming its first general and the latter its first abbot. By 1200 A.D. 200 Christians had been redeemed out of slavery in Morocco by the Trinitarians, and the society spread rapidly in France, Italy and Spain. Aided by Honorius III and Clement IV it afterward spread into Portugal, the United Kingdom, all of south-central Europe and finally to America. From the character of the work done by the order its members came to be known as Redemptionists, and in France by the middle of the 17th century there had been 246 redemptions, releasing 30,720 prisoners, while the numbers for Castile and Leon were 362 redemptions and 11,809 prisoners. By the 18th century the order possessed over 300 houses, but it was rapidly nearing its end, which came in the latter half of that century; it is now almost extinct, having outlived its usefulness.

**REDEMPTORISTINE NUNS,** or **ORDER OF THE MOST HOLY REDEEMER,** a religious order of women in the Roman Catholic Church, founded in 1732 by Saint Alfonso de Liguori. They are strictly cloistered, leading the contemplative life, and by their prayers assisting the missionary priests of the order of Redemptorists (q.v.).

**REDEMPTORISTS.** See ORDERS, RELIGIOUS.

**REDEYE,** the name of two or more common fresh-water fishes: (1) the rockbass or goggle-eye (*Ambloplites rupestris*) (see BASS); (2) in England the rudd, a reddish roach-like fish (*Leuciscus erythropthalmus*), sometimes two pounds in weight, and highly esteemed by anglers both in Great Britain and on the Continent.

**REDFIELD, Edward Willis,** American artist: b. Bridgeville, Del., 1868. After early training at the Pennsylvania Academy of Arts, he studied under Fleury and Bonguereau in Paris. In 1896 he won the gold medal of the Art Club of Philadelphia, the first of a long list of medals and awards that his paintings received. Excelling in landscape painting, his inspiration largely drawn from his home surroundings in Delaware, he is represented in the leading art collections and museums of the country, in the Luxembourg (Paris), in the Honolulu museum and in the National Gallery, Buenos Aires. In 1904 he was elected a member of the National Academy.

**REDFIELD, Isaac Fletcher,** American jurist: b. Wethersfield, Vt., 10 April 1804; d. Charlestown, Mass., 23 March 1876. He was graduated from Dartmouth College in 1825, admitted to the bar and engaged in law practice. He was attorney-general for Orleans County, Vt., in 1832–35, judge of the Vermont supreme court in 1835–52, chief justice in 1852–60, and in 1857–61 occupied the chair of jurisprudence at Dartmouth. He removed to Boston in 1861, and in 1867–69 was special counsel in Europe for the United States. He was editor for New England of the ‹American Law Register› and published ‹Law of Railways› (1857); ‹Law of Wills› (1864–70); ‹Leading American Railway Cases› (1870), etc.

**REDFIELD, William Charles,** American scientist: b. Middletown, Conn., 25 March 1789; d. New York, 12 Feb. 1857. In 1803 he was apprenticed to a mechanic at Upper Middletown (now Cromwell), in 1811 set up for himself at Middletown as a mechanic and small merchant, and in 1821 began his study of the subject of Atlantic gales by observations of the region in eastern Connecticut and western Massachusetts devastated by the storm of 3 September, long known as the «great September gale.» By his investigation of the course and direction of prostrated objects, he became convinced that the storm was a progressive whirlwind. The perfecting of his theory of storms became his chief object. In 1831 he began the publication in the *American Journal of Science* of a series of articles on the laws of storms; and in 1834, in an article in the same journal on ‹Hurricanes of the West Indies› gave a complete synopsis of the main points of his theory as developed by a more extensive analysis of observed phenomena. His views, known as the «rotary theory of storms,» were accepted after some slight opposition; and Redfield, by his explanation of the mechanism of extended hurricanes, became one of the principal contributors to a scientific knowledge of the earth's atmosphere. He wrote also on geography and geology. As a naval engineer he devised the system of «safety barges,» by which passenger service via the Hudson between New York and Albany was conducted by means of a passenger boat drawn by two steamers at such a distance as to avoid danger of explosions, the frequent occurrence of which had caused general terror. Thus originated the idea of tow-boats for the conveyance of freight. Redfield was also prominently interested in railway construction. A list of his published papers, from 1829 to 1857, includes 62 titles.

**REDFIELD, William Cox,** American Cabinet officer: b. Albany, N. Y., 18 June 1858. He engaged in the manufacture of machinery, became president of J. H. Williams and Company in 1905, of the Sirocco Engineering Company in 1907, and was vice-president of the American Blower Company in 1909–13. He served in Congress in 1911–13, and on 4 March 1913 became Secretary of Commerce in the Cabinet of President Wilson, serving to 1 Nov. 1919. He wrote ‹The New Industrial Day› (1912).

**REDFIELD,** S. Dak., city, county-seat of Spink County, on the Chicago, Milwaukee and Saint Paul and the Chicago and Northwestern railroads, about 35 miles south of Aberdeen. It is an agricultural and stock-raising region. It has a State Institution for the Feeble-Minded and the Redfield College, opened in 1887 under the auspices of the Congregationalists. Pop. (1920) 2,755.

**REDFIN.** See SHINER.

**REDFISH,** the name of several fishes notable for their color: (1) In Alaska, the salmon more familiarly known by its name «blueback» in the Columbia River Valley; also called redfish about the lakes of northern Idaho. (2) On the California coast, a gaudily tinted wrasse (*Pimelometopon plucher*), related to the eastern tautog, which reaches a weight of 12 or 15 pounds, and is taken in large numbers in the kelp offshore with hook and line. The Chinese salt and dry them. (3) The rose-fish (q.v.) of the Atlantic Coast. (4) The red drum. See DRUMFISH.

**REDGAUNTLET,** rĕd-gänt'lĕt, a novel by Sir Walter Scott, published in 1824. Sir Alberick Redgauntlet, ardently espousing the cause of the Young Pretender in 1745, pays for his enthusiasm with his life. His widow, ascribing her bereavement to the politics of the Redgauntlets, desires to rear her children in allegiance to the reigning dynasty. Her efforts prove ineffectual and the tale is concerned with the plots to enthrone the Chevalier, into which young Redgauntlet is hurried by his uncle, an ardent Jacobite. Though showing haste, the story does not flag in interest, and even the minor characters — notably Peter Peebles, the crazy litigant, Wandering Willie, the vagabond fiddler, and Nanty Ewart, the smuggler — are living and individual.

**REDGRAVE, Richard,** English painter: b. Pimlico, London, 30 April 1804; d. London, 14 Dec. 1888. After studying at the Academy, he was elected an A.R.A. in 1840, an R.A. in

1851. From 1847 he took a prominent part in art instruction, and in 1857 was appointed inspector-general of art schools, which office, with that of surveyor of the royal pictures, he resigned in 1880. His principal pictures include 'Gulliver on the Farmer's Table' (1837); 'The Daughter of the Reduced Gentleman' (1840); 'The Return of Olivia'; and 'Country Cousins.' He wrote with his brother, 'A Century of English Painters' (1866), and edited several valuable catalogues.

**REDHEAD,** a duck (*Aythya americana*), related to the pochard and canvas-back (qq.v.). From the latter the redhead may be readily distinguished by its much shorter, broader, more strongly hooked bill, and brighter chestnut head, though it is frequently sold to the uninitiated as the more expensive canvas-back, to which it is little inferior in flavor. It is found in North America generally, breeds from the northern tier of States to high latitudes, and winters in Chesapeake Bay and southward. The nest is built of reeds, etc., with a lining of down, and either on the ground or on a platform of reeds in the water; the seven or eight eggs are buff-colored and unmarked. Eastwardly this is one of the commonest species of ducks and congregates in great numbers in the sounds and estuaries of the Atlantic Coast, consorting with canvas-backs, scaups and other species of generally similar habits. It feeds on various aquatic animals, but more particularly on water celery and other aquatic plants. In the interior about the Great Lakes and elsewhere, these birds usually appear in flocks for a short time during the migrations and are said to visit the woods for the purpose of feeding on acorns and other mast like the wood-duck. The redhead is perhaps the best known and generally appreciated by gunners of all our ducks, but there is nothing especially distinctive of the method of its pursuit. Consult Grinnell, 'American Duck Shooting' (1901); Job, 'Among the Waterfowl' (1902).

**REDING, Aloys von,** Swiss patriot: b. Schwyz, Switzerland, 6 March 1765; d. there, 5 Feb. 1818. He became captain-general of his native canton in 1788, and defeated the French republicans at Morgarten Pass in 1798. In 1802 he founded a league in the eastern part of Switzerland with the purpose of re-establishing the old federal constitution, but was thwarted by French interference. In 1803 and in 1809 he was elected chief magistrate of Schwyz.

**REDISCOUNTING.** To foreigners it has always been a subject of wonderment that rediscounting remained in American banking history a branch of financial service availed of little or not at all. Rediscounting has even been looked upon by American bank authorities askance as a «bad» practice and an evidence of weakness on the part of those establishments who had resort to it. What little work in this branch of the financial exchange business has been done was largely confined to country banks, chiefly in the southern States, who have had resort to the system to a small extent, rediscounting with their depositary banks in the large cities as an accommodation. But of the total of loans and discounts the rediscounts have figured as a small item only. In Europe, on the other hand, rediscounting constitutes a very large proportion of the great banking business. The Bank of France at Paris and the Reichsbank at Berlin transact a great volume of business in the rediscounting department, and all the great central banks of Europe find it forms a most important branch of their service. It is generally asserted that the main reason for non-usage of this form of exchange in our commercial life on a larger scale is, that the favored commercial instrument has been the single-name promissory note, just as the bill of exchange has always been the European standby. The consequence has been that, upon its being discounted by the bank, the promissory note has lain as a «dead asset» in the safety vault, as a commodity not capable of being converted into cash until the arrival of date of maturity. The great advantage of the bill of exchange or «acceptance,» as in such general use in Europe, is evident in its commercial course. The bill, once drawn by a customer and accepted by his bank, acquires the value of an instrument salable anywhere — it is freely discounted in open market and passes from merchant to merchant or bank to bank, accumulating fresh endorsements at each transaction until it at last reaches the counter of one of the central banks. Here it is appreciated as accommodating the banking business in the voluminous collecting and transference of funds as well as a source of cash supply for the general class of banks. A fundamental obstacle to the general use of a rediscounting system has, of course, been the fact that here we have had no central bank, the great rediscounting factor in European finance. The National Bank Law has not permitted national banks to accept time drafts and the Federal Reserve Act failed to give relief here except for bills based upon foreign trade. But the Federal Reserve Act now enables the reserve bank's members to handle commercial paper and the rediscount system's future is brighter in the United States, and a dozen regional banks in different sections of the country are enabled to pool and convert some of their assets into cash by rediscounting good commercial paper as defined under the act. Now, the strength of the popularity in European banking concerns of rediscounting is the fact that the rediscounting makes the paper a surer asset and the more endorsements it receives the more the security is enhanced, except that each lapse of time makes the note more and more of a temporary security. A1 bankers acceptances are so liquid as to be a desirable investment of private bankers.

**REDLANDS,** rĕd'lạndz, Cal., city in San Bernardino County; on the Atchison, Topeka and Santa Fé and the Southern Pacific railroads, about 68 miles east of Los Angeles. It was settled in 1881 and in 1888 was incorporated. It is on the foothills of the San Bernardino Mountains, 1,360 feet above sea-level, in a region famous for its scenic beauty. It is in a fruit section noted for its oranges. It is the largest orange shipping centre in the world. Fire-clay is found in the vicinity. The principal manufacturers are clay and lumber products; and the trade is chiefly in oranges, raisins and other fruits, wheat, barley, brick, lumber and building stone. It has high school, public and parish schools, and the A. K. Smiley Library, University of Redland. Eight parks, among them Smiley Heights, add to the attractions of the city. The government is vested in a board of trustees. They hold office four years. Pop. (1920) 9,571.

**REDLEG**, one of the best known of Old World partridges (*Caccabis rufa*), which is especially numerous in France, where it is the principal object of sport in the autumn. It has been introduced into England, but is not much liked because slow to fly, running speedily before the dog and so puzzling both the dog and the gunner trained to the different behavior of the British gray partridge. Several other species of the genus share the name, as the Barbary partridge (*C. petrosa*) of North Africa, the chukar (*C. chukar*) of India, etc. See PARTRIDGE.

**REDLICH**, răt'lĭcн, **Joseph**, Austrian author and professor of law: b. Göding, Mähren, 18 June 1869. He was educated at Vienna, Leipzig and Tübingen, and from 1906 was a member of the faculty at the University of Vienna. He lectured at Harvard in 1910, and was in the United States in 1914 in connection with the Carnegie Foundation. He has written ‹Englische Lokalverwaltung› (1901; English trans. 1903); ‹Recht und Technik des Englischer Parlamentarismus› (1905; English trans. 1908); ‹The Common Law and the Case Method in American University Law Schools› (1914), etc.

**REDMOND**, rĕd'mŏnd, **John Edward**, Irish political leader: b. Dublin, 1851; d. March 1918. He was educated at Trinity College, Dublin, studied law and was admitted to the bar. In 1876 he was elected a member of the House of Commons from New Ross, and later held a position in the vote office. From 1885 to 1891 he sat for North Wexford and from 1891 to his death was member for Waterford. In the House he became a «whip» for the Irish party, and was one of the most active supporters of Parnell in his organization of the Irish Nationalist party. He made several trips to the United States and Canada in behalf of the Nationalists. When the party was divided over the question of the continuance of Parnell's leadership, he supported Parnell. In 1900, when the factions were united, he was made the leader of the united party, which he effectively organized. When the Liberals returned to power in 1906, Redmond's position became one of supreme importance to Ireland and for the following eight years he ably led the movement having for object a measure of self-government for Ireland. His final triumph came when the Home Rule Bill was passed in 1914. On the outbreak of the war with Germany, Redmond, assuming to speak for all Ireland, pledged her support without condition in the war. Meanwhile, Redmond and his party had alienated the support of the younger generation of Irishmen, who disliked the machine methods of the Nationalists at the elections. However, the party and Redmond had grown old during the strenuous years in which they fought for an equitable settlement of the land question and they were not receptive of the new ideas and ideals of nationality which had permeated the younger generation through the work of the Gaelic League and similar organizations. The Insurrection of Easter week 1916 showed to what a point cleavage had come between Redmond, his party and young Ireland. The stern methods with which the insurrection was suppressed drew all Ireland (Protestant Ulster excepted) together in opposition to the hidebound methods of a leader and party who had become impotent. At by-elections in 1916 and 1917 members of the Sinn Fein or revolutionary party defeated Redmond's candidates and he saw nothing ahead but the breaking up of the old political machine which had outlasted its usefulness. It is believed his end was hastened by the trend of events in Ireland. Redmond was a skilled parliamentarian and an eloquent and forceful orator. He published ‹Historical and Political Addresses› (1898), ‹Ireland and the War› (1915).

**REDONDO BEACH**, Cal., city in Los Angeles County, on the Pacific Coast, 18 miles southwest of Los Angeles, on the Atchison, Topeka and Santa Fé Railroad. It is a pleasure resort with ample amusement facilities; and is also important as a shipping point. The city is growing rapidly. Pop. (1920) 4,913.

**REDONDA** (rā-dŏn'dạ) **ISLAND**, West Indies, one of the Leeward group, situated between Nevis and Montserrat. Iron and alumina mines constitute its economic importance. It is a dependency of Antigua, and with Barbuda, another dependency, makes an area of 62 square miles. The total population of the three islands is about 35,000.

**REDOUBT**, Alaska, active volcano in the Aleutian Range, near the west coast of Cook's Inlet. Its altitude is 11,270 feet, and it was active in 1903.

**REDOWA**, rĕd'ō-ạ, the name of a Bohemian dance introduced into England about 1846. The dance resembles the Polish mazurka. It was introduced into one of Meyerbeer's operas in 1849.

**REDPATH, James**, journalist: b. Berwick-on-Tweed, England, 14 Aug. 1833; d. New York, 10 Feb. 1891. He emigrated to Detroit, Mich., in 1848, and in 1852 removed to New York and became connected with the *Tribune*. In 1855 he went to Kansas and took part in the Free-Soil movement which he described for northern papers. Being already a confirmed anti-slavery advocate he traveled in the South for personal investigation of slavery conditions. With others he then undertook a scheme of colonization in Haiti and during his visits to the island was appointed by President Giffrard commissioner of emigration in the United States. The breaking out of the Civil War put an end to his plans, and he entered the field as war correspondent principally attached to the armies of Generals Sherman and Thomas. At the close of the war he became superintendent of education in Charleston, S. C., reorganized its school system, and established colored schools and the Colored Orphan Asylum. In 1868 he established the Lyceum Bureau in Boston which arranged for the public appearance of lecturers and readers, which business was afterward purchased by Maj. J. B. Pond (q.v.). Resuming editorial work on the *Tribune*, he went to Ireland to report the famine of 1879–80. There he became interested in the Home Rule movement and devoted several years to its interests. In 1886 he became attached to the staff of *The North American Review.* He assisted Jefferson Davis in preparing his history of the Southern Confederacy, and wrote, among other works, ‘The Roving Editor, or Talks with Slaves in the Southern States’ (1859); ‘The Public Life of Captain John Brown’ (1860); and ‘Talks About Ireland’ (1881).

**REDPOLL,** a small linnet-like finch of the far northern regions, two to three species of which visit northern Europe, Canada, and the northern United States in winter. The males have the head and neck beautifully rose-red in hue.

**REDROOT.** See Ceanothus.

**REDS OF THE MIDI, The.** The first book written in modern Provençal to be published in English was ‘The Reds of the Midi’ (‘Les Rouges du Midi,’ 1896). In a Prologue, Félix Gras gives a charming picture of his own boyhood and of his juvenile admiration for the Napoleonic veteran Pascal. Then he introduces us to the little company at the shoemaker's shop where in the evenings old Pascal was wont to tell stories of his campaigns from the Pyramids to Moscow to a little company of whom the boy Félix was not the least eager listener. ‘The Reds of the Midi’ is based in part on what Gras learned from his grandfather and from Pascal who is made to tell here of the wanton feudal oppression at which his boyhood revolted, of the perils that beset his youth, of his enlistment at Avignon in the famous Marseilles Battalion, the 516 who gave to France its battle song, and, on the memorable 10 Aug. 1792, led the attack on the «King's Castle,» the Tuileries. This rising of a people is shown as the simple, brave, honest soldier boy might have seen it, and with great art is made to appear wholly objectively from the peasant's point of view. Notable as fiction, the story has, as the author wrote to William E. Gladstone, also the historical purpose «to prove . . . that it was the men of the South who were the first to rise up against despotism, and that to them the triumph of the Revolution was due. And to prove also that from them came the first protest against the errors, and the violence and the excesses of the Reign of Terror.» There are graphic glimpses of the September massacres and of the guillotine. The translation by Catherine A. Janvier is of exceptional merit. The story is continued as to several minor characters in ‘The Terror’ (1898).

Benjamin W. Wells.

**REDSHANK,** or **GAMBET,** a large migratory snipe-like sandpiper (*Totanus calidris*) of Europe and Asia, representative of a large group, the American species of which are called willets by gunners; its average length is about 11 or 12 inches; and its popular name is derived from the red color of the legs. The spotted redshank (*T. fuscus*) and the greenshank (*T. glottis*) are allied species.

**REDSTART,** in the United States a small active migratory warbler of the genus *Setophaga,* especially *S. ruticila* of the eastern part of the country, whose colors are a charming contrast of black and orange-red in the male, the female being more nearly brown and yellow. It has a sharp, exclamatory, but pleasing spring song, and makes a pretty nest of bark-shreds, etc., in an orchard tree or garden bush. The European redstarts are small brownish birds, closely related to the redbreasts, but distinguished by a bright red tail. They construct nests chiefly among the ivy of ruined buildings, the eggs numbering five or six, and being of a greenish-blue color. The redstarts are active birds, feeding on fruits, seeds, and insects which they pursue on the wing. The song is low, but sweet, and these birds are said to imitate very skilfully the notes of other feathered songsters.

**REDTAIL,** a common American hen-hawk (q.v.).

**REDTOP.** See Grasses in the United States.

**REDWAY, Jacques Wardlaw,** American geographer: b. Nashville, Tenn., May 1849. He was educated at the University of California and at Munich, Bavaria. He occupied the chair of physical geography and chemistry at the State Normal School of California, was engaged in mining engineering and exploring in California and Arizona in 1870–80, and later pursued geographical investigations in South America, Europe and Asia. He has published ‘Manual of Geography’ (1887); ‘Manual of Physiography’ (1900); ‘New Basis of Geography’ (1901); ‘Commercial Geography’ (1902), etc.

**REDWING.** (1) An American blackbird (*Agelaius phœniceus*) found throughout the United States and wintering south of Virginia. The male is jet black except for the wings which are a bright scarlet with a border of buff color. The nest is made of coarse grass or reeds built in a marsh or swamp. Its call is loud and clear. (2) A European thrush (*Turaus iliacus*), visiting Great Britain and southern Europe in winter, when they flock in the fields in search of insects and worms. The summer is spent in the north of Europe and Asia. The summer song is pleasing, but the winter notes are harsh and unmusical. The head, upper part of the body and tail are a rich brown; the lower part of the body is white with streaks of brown.

**REDWOOD, Sir Boverton,** English chemist: b. London, 26 April 1846. He was educated at the University College School and accompanied Sir Vivian Majendie on an inspection tour of the petroleum fields of Europe, Canada and the United States. He became a consulting engineer and chemist and was appointed adviser on petroleum to the Admiralty, the Home office, the India office and the Colonial office. He was created a baronet in 1911. He served on the war committees of the board of trade, the ministry of munitions and the Admiralty board of invention and research during the European War. Author of ‘Cantor Lectures on Petroleum and its Products’ (1886); ‘The Transport of Petroleum in Bulk’ (1894); ‘A Treatise on Petroleum’ (2 vols., 1896; 3d ed., 3 vols., 1913); and joint author of ‘The Detection and Estimation of Inflammable Gases and Vapors in the Air’ (1896); ‘Handbook on Petroleum’ (1901); ‘Petroleum Technologists' Handbook’ (1915), etc.

**REDWOOD,** the name of various sorts of wood, as an Indian dyewood, the produce of

*Pterocarpus santalinus;* the wood of *Laplacea hæmatoxylon,* the redwood of Jamaica; that of *Pterocarpus dalbergioides,* or Andaman wood; that of *Colubrina ferruginosa,* the redwood of the Bahamas; that of *Soymida febrifuga,* of which the bark is used in India for fevers. In the United States, *Sequoia sempervirens* of the Pacific Coast. See REDWOOD OF CALIFORNIA.

**REDWOOD OF CALIFORNIA,** the great cypress-like forest tree (*Sequoia sempervirens*) of the Pacific Coast. It is of the same genus with the big trees (*S. gigantea*), botanically described under SEQUOIA; the latter occurs in scattered groups on the west slope of the Sierra Nevada, while the redwood forms dense forests on the west slopes of the Coast Range, where it forms the most important timber resource of the State. The forests were thoroughly studied by the government bureau of forestry in 1902, whose report furnishes the following facts: The redwood is popularly thought to occupy a strip of country 10 to 30 miles wide, from the Oregon line to the Bay of Monterey, but these boundaries do not cover its actual distribution. Two thousand acres of redwood exist in Oregon along the Chetco River. South of the Chetco a continuous redwood belt begins, and increases its width from 10 miles, at Del Norte County, to 18 or 20 miles, and keeps on unbroken to southern Humboldt County. Here is a break, but in Mendocino County the belt becomes dense again, and widens out to 35 miles. South of that county the tree grows in isolated patches as far south as the Santa Lucia Mountains.

The climate and topography that have brought about this limited distribution of the redwood deserve attention. North and south along the coast, in nearly parallel ridges, lie the mountains of the Coast Range, steep and rising to altitudes of 1,000 to 2,000 feet. A few large rivers and many smaller streams cut through them to enter the sea, and along their courses in places are broad bottom lands and gentle slopes. West of the Coast Range the climate is even and moderate, with a range from just below freezing to 80° F., and a yearly average of from 50° to 60°. Snow lies on the tops of only the highest ridges. Thirty to 60 inches of rain falls in the autumn and winter, and in the summer sea fog bathes the coast. But east of the mountains, less than 50 miles from the sea, lie hot interior valleys, never visited by the fog, parched and rainless in the summer, and wet only occasionally by the winter rains — conditions too unfavorable to permit the growth of the redwood. The forest may be considered in two types — the «slope» and the «flat.» The common type is the «slope»—that is, the growth on the steep sides of the Coast Range, which is a mixture of redwood, red fir, tanbark oak and white fir, with an occasional madroña or hemlock. As the slopes become moderate, the altitude lower, the soil deeper and the water supply better, the redwood steadily gains on the other kinds and the forest becomes denser, until on the rich flats and in the gulches the second type is developed; on the best redwood «flats» no other tree grows.

The redwood grows to a greater height than any other American tree, but in girth and in age it is exceeded by the big trees of the Sierras. On the slopes 225 feet is about the maximum height and 10 feet its greatest diameter, while on the flats, under better conditions, it grows to be 350 feet high, with a diameter of 20 feet, and occasional giants exceed this. Most of the redwoods cut are from 400 to 800 years old. After the tree has passed the age of 500 years it usually begins to die down from the top and to fall off in growth. The oldest tree scientifically examined began life 531 A. D. The tree, when normal, has a straight, slightly tapered bole, clear for more than 100 feet, and a crown of horizontal branches that may occupy from a third to a half of its total length. The roots strike downward at a sharp angle, and are so large and so numerous as to form a compact mass of wood, in shape like an inverted funnel. The bark of the tree offers such a remarkable resistance to fire that except under great heat it is not combustible. It is of a reddish-gray color, fibrous in texture, and gives to full-grown trees a fluted appearance. The tree, however, assumes many shapes.

The redwood requires little of the soil except that it be moist, and those trees in a gully or along a creek are larger than their neighbors on the ridges. It is, however, so dependent on moisture of the air that this factor mainly or wholly determines its distribution, and the eastern limits of the forests are determined by the distance inland to which the sea fogs may drift.

The enemies of the redwood are few, and it suffers from them less than other trees. «The wind,» remarks Fisher, «can scarcely uproot it, insects seem to do it little harm, and fungi seldom affect it. Even fire, the great enemy of all trees, though it may occasionally kill whole stands of young redwood growth, is unable to penetrate the fireproof sheathing of shaggy bark with which the old trees protect themselves.» A large area of redwood forest in Santa Cruz County has been reserved as a national forest-park.

**Reproduction.**—The redwood forest consists of a mixture of trees of widely varying type, and keeps itself stocked by reproduction under its own shade. Seeds grow up very seldom, the seed itself seeming to have little vitality and the opportunities for its germination being rarely present, because it demands plentiful light. Hence new growth is almost exclusively by suckers, which supported and nourished by full-grown roots and stems, thrive under shade in which seedlings would wither. They thus survive and grow slowly, with little or no sun, until an old tree falls, lets in the light and they shoot up in rings about the stump into strong young trees. In 30 years, under favorable conditions, trees will result 16 inches in diameter and 80 feet high; and it is certain that it will be profitable to hold cut-over redwood lands for future crops. This second-growth timber has not the density and fine quality of the original, but is useful for many purposes, and large quantities have already been utilized.

**Quality of the Wood.**—Redwood is fitted for many uses. In color it shades from light cherry to dark mahogany; its grain is usually straight, fine and even; its weight is light; its consistency firm, yet soft. It is easily worked, takes a beautiful polish and is the most durable of the coniferous woods of California. It resists decay so well that trees which have lain

500 years in the forest have been sent to the mill and sawed into lumber. It has no resin, and resists fire, a fact which has recommended it as material for house-building, especially in San Francisco. Insects seldom injure it, because of an acid element its lumber contains. In sea water, however, the marine teredo eats off redwood piling as readily as other timber. Redwood is used for all kinds of finishing and construction for shingles, railroad ties, electric-light poles, paving blocks, tanks and pipe staves. As a tie its average life, under heavy traffic, is six to eight years; as shingles it will last as long as 40 years. The chief difficulty in working redwood lies in the seasoning process, to dry it thoroughly being a slow and difficult process.

**Lumbering.**— The cutting of redwood for market began about 1850, and has steadily increased since with the market demand and growth of means of transportation. Its use is mainly confined to the State, and the greatest demand is from the southern counties. Occasional cargoes are sent across the Pacific, but it is rarely sent East, on account of the expense of transportation. It has never been a business giving extravagant profits. Several hundred thousand acres have already been cut over. A large part of this area has been completely cleared and cultivated or used for pasture but much remains as wild brush, believed to be useless; but it is now known that ordinarily a profitable second growth will arise, so that the anticipated extinction of the tree is no longer to be feared.

Felling one of these enormous trees is an operation requiring great experience and skill on the part of the woodsman, who must cause the vast trunk to fall precisely where he intends it to lie, and must take care that it is not split or broken by the concussion, to prevent which a bed is smoothed and prepared for it. A platform is first erected surrounding the trunk from six to eight feet above the ground. With a long saw in the hands of two men an undercut is made through the trunk, not quite to the centre, and from the opposite side a crosscut is sawed, ending a foot or two above the undercut and leaving a section of solid wood between. When the exact place where the tree is to fall is selected, the choppers ascend the platform and with axes hew out an angular-shaped piece having the undercut as a base. When this cut is made the second or crosscut is wedged till the tree topples over and falls to the ground, the solid section of the trunk, not pierced by the cuts, supporting the tree till the centre of gravity is passed, and then the mighty frame falls on its prepared bed almost intact.

The next operation is performed by the «ringers» and «peelers.» Every 12 or 14 feet, as required, a ring is cut around the circumference of the bark, and afterward the peelers with crowbars and wedges «peel» the bark from the prostrate trunk. All of the trees are stripped but surrounded with an immense accumulation of débris of bark and branches, which must be removed before the trunks can be sawed into suitable lengths for conveyance to the mill. The ground is cleared of this débris by fire, precaution being first taken to plug up the «splits» in the trunk with clay so that the fire may not reach the interior of the tree. A foggy day is chosen and a still one. Fire is started and in a short time the tract is burning with a fierce heat that quickly reduces the piles of bark and brush to ashes, and leaves an unobstructed field for the removal of the solid timber which has been scarcely charred by the intense heat to which it has been subjected.

The trunks as they lie are then sawed into stated lengths, and then follows the arduous task of conveying these enormously heavy sections to the railroad. Temporary skidways are laid down and roads constructed. Chutes down which the logs pass have to be planned, and on these, guided by the skilful woodsmen, the unwieldy logs at last reach their destination. The work is assisted by donkey engines on sleds, which are hauled to the top of the steep banks and into seemingly impossible situations.

The yield of virgin redwoods on the northern flats varies from 125,000 to 150,000 board feet per acre. About Humboldt Bay it was from 50,000 to 75,000 feet per acre; and on slopes like those in Sonoma County, from 20,900 to 30,000 feet. The redwood cut of 1916 was 491,000,000, the largest recorded, being about 35 per cent of the entire lumber cut of the State. The amount of timber got out of a redwood forest is only a small proportion of what the stand contained. At least a quarter of the timber is destroyed in felling and in the burning that follows, and of what remains all the broken and misshapen logs are left on the ground.

**Bibliography.**— Fisher, ‹Report on Redwood,› Bureau of Forestry (Washington 1903); and authorities on California, especially Muir, and on forestry. See FORESTRY.

**REED**, rēd, **Andrew**, English philanthropist: b. London, 27 Nov. 1787; d. there, 25 Feb. 1862. He was educated at Hackney College, London, ordained pastor of the Congregational Chapel at New road, London, in 1811 and remained in this charge until 1861. He visited the United States in 1834 to study educational and religious systems and established in London the Orphan Asylum (1813), Infant Orphan Asylum (1827), Asylum for Idiots (1846), Royal Hospital for Incurables (1855) and an Asylum for Fatherless Children in Croydon. He published ‹Visits to the American Churches› (1836); ‹Advancement of Religion the Claim of the Times› (1847), etc. Consult ‹Memoirs,› edited by his sons (1863).

**REED**, SIR **Charles**, English politician and philanthropist, son of Andrew Reed (q.v.): b. near Sonning, Berkshire, 20 June 1819; d. Tottenham, Middlesex, 25 March 1881. He amassed a large fortune in the typefounding business, took an active interest in the philanthropic works of his father, served in Parliament as member for Hackney in 1868–74 and was reelected for Saint Ives in 1880. He was president-chairman of the London school board in 1873–81 and in 1874 he was knighted.

**REED, Charles Alfred Lee**, American surgeon: b. Wolf Lake, Ind., 9 July 1856. He was educated at Miami University, Oxford, Ohio, and studied medicine at the Cincinnati College of Medicine and Surgery. He was professor of gynæcology and abdominal surgery at the Cincinnati College of Medicine and Surgery 1882–95; became gynæcologist at the Cincinnati

Hospital in 1896, and was president of the American Medical Association in 1900–01. He has published various professional monographs and a ‹Text Book of Gynæcology› (1900).

**REED, Sir Edward James,** English naval architect: b. Sheerness, 20 Sept. 1830; d. 30 Nov. 1906. He was educated at the School of Mathematics and Naval Construction in Portsmouth, was at one time connected with Sheerness dockyard, and having become an authority on naval architecture was appointed chief constructor to the navy, for which he designed a number of ironclads and other vessels. He resigned in 1870 on account of his objections to rigged sea-going turret ships which he found to be growing in favor. He sat in Parliament for the Pembroke boroughs 1874–80, for Cardiff in 1880–95 and again 1900–06. In 1886 he was a junior lord of the treasury under Mr. Gladstone. In 1878 he visited Japan on the invitation of the government of that country. He published ‹Japan, its History, Traditions and Religions› (1880); ‹The Stability of Ships› (1884); ‹Modern Ships of War,› with Admiral Simpson (1888); ‹Poems› (1902).

**REED, Elizabeth Armstrong,** American author: b. Winthrop, Me., 16 May 1842; d. 16 June 1915. She was married to H. V. Reed in 1860. She was chairman of the Woman's Congress of Philology in Chicago in 1893 and was a member of several learned societies. She published ‹The Bible Triumphant› (1866); ‹Hindu Literature: or the Ancient Books of India› (1891); ‹Persian Literature, Ancient and Modern› (1893); ‹Primitive Buddhism, its Origin and Teachings› (1896), etc.

**REED, George Edward,** American educator: b. Brownville, Me., 21 March 1846. He was graduated from Wesleyan University, Middletown, Conn., in 1869 and after studying theology in Boston University entered the New England Southern Conference in 1870. He filled important appointments in the Methodist denomination 1870–89 and in the year last named became president of Dickinson College, Carlisle, Pa.

**REED, Hugh T.,** American military officer: b. Richmond, Ind., 17 Aug. 1850. He was graduated from West Point in 1873 and served chiefly on frontier duty until 1881 when he was appointed inspector-general on the staff of Governor Porter of Indiana. He was retired for disability in 1889. He has published ‹A Calendar of the Dakota Nation› (1887); ‹Cadet Regulations› (1881); ‹Broom Tactics› (1883), etc.

**REED, James A.,** American legislator: b. near Mansfield, Ohio, 9 Nov. 1861. He removed with his parents to Lynn County, Iowa, in 1864, studied at Coe College, Iowa, and was admitted to the bar in 1885. He engaged in practice at Cedar Rapids in 1885–87, then removing to Kansas City, Mo. He was prosecuting attorney of Jackson County, Mo., in 1898–1900, and mayor of Kansas City in 1900–04. He was elected to the United States Senate for the terms beginning 1911 and 1917.

**REED, John Oren,** American physicist and educator: b. New Castle, Ind., 31 Dec. 1856; d. 22 Jan. 1916. He was graduated at the University of Michigan in 1885, studied at Harvard in 1891–92 and took his Ph.D. at the University of Jena in 1897. He was a member of the faculty at the University of Michigan from 1892, becoming professor of physics and director of the physics laboratory in 1909, and serving as dean of the department of literature, science and the arts from 1907. He was joint author of ‹Manual of Physical Measurements› (1902); ‹College Physics› (1902); ‹High School Physics› (1913).

**REED, Joseph,** American soldier and statesman: b. Trenton, N. J., 27 Aug. 1741; d. Philadelphia, 5 March 1785. He was graduated from Princeton and spent two years studying law in the Middle Temple, London. He returned to Trenton and took up the practice of law and in 1767 was appointed deputy secretary of New Jersey. In 1774 he was appointed a member of the committee of correspondence for Philadelphia and in 1775 was president of the 2d provincial convention held in Pennsylvania and endeavored to defeat the intention of arming the province. His English connections through his marriage inclined him to a conciliatory view of the English position, though he opposed the principle of Parliamentary taxation. On Washington's appointment to commander-in-chief, Reed became his military secretary. In 1776 he was made adjutant-general, but resigned the next year and refused the office of brigadier-general and also first chief justice of Pennsylvania, preferring to remain Washington's volunteer aide, without rank or pay. In September 1777 he was elected to the Continental Congress but continued with the army and took part in many engagements. In 1778 he was made chairman of a Congressional committee to confer with Washington concerning the management of the ensuing campaign. In December 1778 he was chosen president of the supreme executive council of Pennsylvania and continued in office for three years, during which time he was one of the founders of the University of Pennsylvania and favored the doing away with the proprietary powers of the Penn family. After the English peace commissioners had failed to treat with Congress, attempts were made to bribe Reed together with other high officials. He replied: «I am not worth purchasing, but such as I am, the king of Great Britain is not rich enough to do it.» In 1780 he was invested with extraordinary powers and was principally successful in quelling the dissatisfaction of the Pennsylvania troops in the army. Consult ‹Life› by Henry Reed (1846); Reed, W. B., ‹Life and Correspondence› (1847).

**REED, Myrtle,** American author: b. Chicago, Ill., 27 Sept. 1874; d. 1911. She has published ‹Love Letters of a Musician› (1899) which has been widely read; ‹Later Love Letters of a Musician› (1900); ‹The Spinster Book› (1901); ‹Lavender and Old Lace› (1902; new ed., 1907); ‹The Master's Violin› (1904); ‹A Spinner in the Sun› (1906; new ed., 1909); ‹Old Rose and Silver› (1909); ‹Master of the Vineyard› (1910; new ed., 1911); ‹Threads of Grey and Gold› (posthumously, 1913).

**REED, Thomas Brackett,** American statesman: b. Portland, Maine, 18 Oct. 1839; d. Washington, D. C., 7 Dec. 1902. He was graduated from Bowdoin College in 1860, winning the first prize in English composition. He then took up the study of law, went to California in 1863, and was admitted to the bar there. In 1864 he was appointed assistant paymaster in the United States navy and assigned to a gunboat patrolling the Tennessee, Cumberland and Mississippi rivers. On receiving his discharge from the navy, he returned to Portland and established a law practice. His interest in public affairs and ability as a speaker soon made him prominent in the Republican party in Maine and in 1868 he was elected to the lower house of the State legislature, where he served two years. He then entered the State senate and before his term had expired, was elected attorney-general of Maine. From 1874 to 1877 he was city solicitor of Portland and in 1876 was elected to Congress and served there continuously until his resignation in 1899. He first attracted attention in April 1878 by a speech in opposition to a bill to reimburse William and Mary College for losses sustained at the hands of the Federal troops during the war. From that time his readiness in debate, knowledge of parliamentary law and marked executive ability made him a power in the House. In 1885–89, while the Republicans were in the minority, he was their acknowledged leader on the floor and in 1899 was chosen speaker of the House. The Republican majority was small and the business of the House continually delayed by the «filibustering» course of the Democrats. Speaker Reed did not hesitate to enforce strict rulings against such tactics and ordered the clerk to count as present all members actually in the House, whether they answered to the roll-call or not. This aroused the strongest opposition from the Democrats; his conduct was denounced as tyrannous and illegal and the epithet of «Czar» applied to him. His rulings were, however, sustained by the House and later by the decision of the Supreme Court; and in the next Congress, when the Democrats were again in power, he had the satisfaction of seeing his rules adopted by the party that had so violently denounced them. In 1895 and 1897, he was again elected speaker and this time his conduct of the business of the House met with the approval of both parties. As speaker, he had a powerful influence in constructing and guiding legislation, though his name is connected with no single important measure and he raised that office to a position second only to that of the President of the United States. He was a consistent opponent of free silver and was largely instrumental in defeating the free silver bill of 1890. He was also a strong advocate of the policy of protective tariff but was opposed to the administration policy in regard to imperialism and the questions resulting from the Spanish War. To this fact his resignation from Congress in 1899 is sometimes attributed. In 1896 he was a prominent candidate for the presidency and at the Republican National Convention received 84½ votes, being second to McKinley. After 1899 he was engaged in the practice of law in New York. He contributed frequently to the magazines, edited a series of volumes on oratory entitled ‘Modern Eloquence,’ and published ‘Reed's Rules of Parliamentary Procedure.’

**REED, Walter,** American military surgeon and bacteriologist: b. Harrisonburg, Rockingham County, Va., 1851; d. Washington, D. C., 23 Nov. 1902. He was graduated from the medical department of the University of Virginia and from the Bellevue Hospital Medical College of New York and was made first lieutenant assistant surgeon, United States army, 26 June 1875. His promotions were captain assistant surgeon, 26 June 1880, and major surgeon, 4 Dec. 1903. In 1890–91, while stationed at Baltimore, he made particular study of bacteriology in the laboratory of Prof. William. Welch, of the Johns Hopkins University; and established a laboratory of his own, in which he gave instruction to the student-officers of the Army Medical School. As curator of the Army Medical Museum, at Washington, D. C. (from 1893), he continued his researches and soon became known as one of the leading bacteriologists of the country. His ability was especially displayed in his investigations of the cause and progress of epidemic diseases. In 1898 he was made head of a board for the study of the epidemics of typhoid occurring among the troops collected for the Spanish-American War. After the war he made several voyages to Cuba and was on duty at Havana, studying the diseases of the island and more particularly yellow fever, as a member of a board for its investigation. After a series of brilliant experiments, he was able to announce that yellow fever is conveyed by a certain variety of mosquito (*Stegomyia fasciata*), individuals of which become infected by biting persons ill with the fever and by their bite introduce it into the blood of non-immunes. The United States military government at once proceeded to measures of extermination which banished the fever from Havana, where it had prevailed for three centuries. The Atlantic seaboard of the United States was also thereby freed from constant peril. This achievement must rank among the important triumphs of bacteriological science. Consult Keane, ‘Scientific Work and Discoveries of the Late Major Walter Reed’ (Senate Doc. 118).

**REED, William Bradford,** American lawyer: b. Philadelphia, 30 June 1806; d. New York, 18 Feb. 1876. He was graduated from the University of Pennsylvania in 1825 and accompanied Joel R. Poinsett to Mexico as private secretary. Then taking up the practice of law, he became attorney-general of Pennsylvania in 1838. In 1850 he was appointed professor of American history at the University of Pennsylvania and in 1857 became United States Minister to China. The next year he negotiated the treaty with China which regulated commercial relations as well as made more secure the rights obtained by the previous treaty of 1844. Subsequent to his return to America in 1860 he settled in New York and corresponded for the London *Times* besides contributing to *The American Quarterly Review* and the *North American Review.* He engaged in a controversy with George Bancroft, concerning certain statements repeated by the historian to the effect that his grandfather, Joseph Reed, meditated abandoning the American cause and going over to the British. In this controversy Reed wrote ‘President Reed of Pennsylvania, a reply to George Bancroft and Others’ (1867). Bancroft responded with ‘Joseph Reed, an historical Essay’ (1867), to which Reed replied with ‘A Rejoinder to Mr. Bancroft's Historical Essay› (1867). He published ‹Life and Correspondence of Joseph Reed› (1847); ‹Life of Esther de Berdt› (1853).

**REED,** (1) *in music,* the sounding part of several instruments, such as the clarinet, bassoon, oboe and bagpipe, so called from its being made from the outer layer of a reed (*Arundo sativa* or *donax*) found in the south of Europe. The name is also applied to the speaking part of the organ, though made of metal. Reeds are generally divided into two kinds — the beating reed, used in the organ, clarinet, etc., requiring to be placed upon a tube to produce a musical sound, and the free reed, used in instruments of the harmonium and concertina kind. (2) *In weaving,* an appurtenance of the loom, consisting of two parallel bars set a few inches apart and furnished with a number of parallel slips or reeds, called dents, between which the warp threads are passed. The reed is set in a swinging frame, called a lathe, lay or batten. In the hand lathe, the bottom of the batten is furnished with a shelf, called the shuttle race, along which the shuttle is driven. The office of the reed is to beat the weft up to the web and the force of the blow determines the compactness of the fabric.

**REED, FLUE AND STRINGED INSTRUMENTS, TEMPERAMENT, TUNING AND VOICING OF. Temperament.**— The intervals of the perfect octave are divided naturally into 53 parts or commas, the successive sounds of the diatonic scale being separated by these commas into the following intervals:

| | | | | |
|---|---|---|---|---|
| C to D | 9 | commas | | 9 |
| D " E | 8 | " | | 17 |
| E " F | 5 | " | | 22 |
| F " G | 9 | " | | 31 |
| G " A | 8 | " | | 39 |
| A " B | 9 | " | | 48 |
| B " C | 5 | " | | 53 |

Nature's arbitrary division of the octave, into intervals of exact dimensions, is not satisfactory, nor does it admit of an exact equalizing; the only possible approach to it being by the method known as the «even temperament,» which method or principle was discovered and established by John Sebastian Bach, in the early part of the 18th century, who learned that certain intervals would bear being tuned sharp (in excess of) or flat (short of) perfect; the thirds and fourths being tuned sharp and the fifth tuned flat of perfect, thus distributing among all the 12 keys of the octave, the three commas or points by which the major tones exceeded the minor, thus rendering equal the five tones in the diatonic series. Previous to this time, it had been the custom to tune to perfect intervals, those keys having not over three sharps or flats and play in those keys only. The problem to be solved was to so divide the octave into 12 semitones by fixed sounds, that each one of the 12 sounds could be made the key note upon which a properly proportioned diatonic scale could be based, either in the major or minor form, and a melodic or harmonic progression made possible through the whole 24 major and minor scales; so that from any one of these 12 notes a uniform chromatic scale could be constructed, thus making possible modulations of unlimited variety and beauty.

The method then of tempering the notes of keyed instruments consists in arbitrarily adjusting the enharmonic diesis, that is, the distinction there is naturally between D sharp and E flat, G sharp and A flat, by tuning these notes too sharp for one and too flat for the other of these natural tones or intervals, and by making a similar compromise between the more minute discrepancies of the diatonic scale. Thus while no interval will be exactly true, yet none will be so adjusted as to shock the ear by false intonation, but rather add a color or quality to the tonality of the instrument, which, though harmonious, would otherwise be characterless.

**Rule for Tempering Pianos and Organs.**— Tune middle C to desired pitch, then tune F — fifth below — sharp of C, until between C and F, there result three beats in five seconds. Next tune A-sharp — fourth above F-sharp of the latter, until there results one beat, each second. Next tune G — fourth below middle C — flat of C, by one beat a second; then tune D — fifth above — flat to G, by three beats in five seconds; A — fourth below — flat to D; E — fifth above — flat to A; B — fourth below — flat to E; F-sharp — fourth below — flat to B; C-sharp — fifth above — flat to F-sharp; G-sharp — fourth below — flat to C-sharp; D-sharp — fifth above — flat to G-sharp, which will make D-sharp as sharp of A-sharp, as the latter is sharp of the first F tuned.

In all the above intervals, the fifths beat three times in five seconds; the fourths beat once a second, or five times in five seconds. All the 12 notes, from F below middle C to first E above, have now been tuned; the temperament has been confined to the smallest possible compass to lessen the liability of errors, and if the first F above middle C is now tuned three beats in five seconds, flat of A-sharp below, it will be a perfect octave to the first F tuned.

**Tuning.**— The art, principle or act of so adjusting the intonations of keyed musical instruments as to make possible consecutive musical tones agreeable to the ear. The method varies according to the kind or character of the instrument. Where strings are used, as in pianofortes, harps, violins, violas, guitars, zithers, etc., tuning consists in adjusting the tension of the strings by turning the pins or pegs around which the strings are wound. In band and orchestral wind instruments, a crook or joint is used, sometimes called a slide, because it slides in and out to adjust the length of the column of air in the tube to the point where the desired pitch of the fundamental note is obtained.

In reed organs it depends upon the adjustment of the comparative weight, length and thickness of the reeds, and in pipe organs upon the length of the vibrating column of air in the flue pipes.

In the tuning of strings, the pitch is determined by the size, length and tension of the wire. In reed tuning the desired pitch is obtained by filing or scraping the reed; at the base or fixed end to flatten the tone and at the point or free end to sharpen it.

Organ pipes are tuned according to their construction. The large open flue wood pipes are lowered or flattened in pitch by being lengthened by a sliding cap or by a board fastened to the back, at the top, and is raised or sharpened in pitch by being shortened.

The large open metal flue pipes are tuned by cutting away or adding to the length or by a slit in the back near the top, making two flaps to be opened or closed as required; closing them lowers the pitch, opening them raises it; the small metal pipes being tuned by the use of a conical horn, with which the tops of the pipes are contracted or expanded, as the pitch is to be lowered or raised respectively. Stopped metal pipes are tuned by a cap, raised or lowered as desired, and reed pipes by adjusting the wire which bears upon the reed, the raising or drawing up of the wire increasing the effective length of the reed and so flattening it and vice-versa. In the tunning of pipe organs, the reed pipes are the last to be tuned, since they are the most liable of all the pipes to become disarranged.

**Voicing of Keyed Musical Instruments.**— The voicing of organ pipes consists in the adjustment of their various parts, consisting of the mouth, throat, lips, languid and ears, the correct method of treatment having been learned by experience many years ago and of late years demonstrated by mathematical calculations and by the investigations of scientists.

The languid is that flat piece of the pipe which lies horizontally above the upper part of the foot, and it is against this languid the «sheet of wind» is forced from the «wind way» below. Some of the pipes have the languids grooved upon their face, as one method of voicing, and some metal pipes are voiced by bending the ears, which are placed on either side of the mouth. Pipes once voiced at the factory seldom need any alteration.

The voicing of reeds in the common house organ is accomplished by giving the free end of the reed a slight curl or circumflex, and this also causes the reed to speak or sound more promptly and with less pressure of wind.

The voicing of pianos consists in the stabbing of the felt of which the hammers are made, by several needles fastened in a handle. The thrusts should be made directly toward the centre of the hammer and not through the top of the felt, from the sides. In the making of hammers, which is done by machinery, one entire set being covered with felt at a time, there is a variation as to hardness in the individual hammers, and voicing is relied upon to lighten up the felt and give a uniform character of tone throughout the entire scale of the piano.

Edward Quincy Norton,
*Author of ‹Construction, Tuning and Care of the Pianoforte.›*

**REED-BIRD.** See Bobolink.

**REED CANARY GRASS,** a grass of the genus *Phalaris.* See Grasses in the United States.

**REEDBUCK.** See Reitboks.

**REEDER, Andrew Horatio,** American politician, first governor of Kansas Territory: b. Easton, Pa., 6 Aug. 1807; d. there, 5 July 1864. He practised law at Easton and was a prominent Democratic politician when, in 1854, he was appointed by President Pierce the first governor of the newly-formed territory of Kansas. Upon arriving at his post he at once rendered his position difficult by declaring his intention rigidly to put down the violence resulting from the conflict of the two parties respecting slavery. In the election of March 1855 more than three-fourths of the votes cast were illegal, but the governor issued certificates of election to all claimants whose papers were regular and against whom no protests or official notice of frauds were presented. His action he defended as strictly legal and declared that any other would have been revolutionary, though he confessed to knowledge of the fraudulent voting. He was dismissed from office by the President and he returned to Lawrence to reside and to join forces with the Free-Soil movement. He was nominated by this party as Territorial delegate to Congress. A legislature of the Free-State party formed under the instrument known as the Topeka constitution elected him to the United States Senate in 1856. But the election was refused ratification by Congress. President Lincoln appointed him a brigadier-general at the outbreak of the war, but considerations of age induced him to decline. Consult Spring, ‹Kansas› (1885); Robinson, ‹The Kansas Conflict› (1892).

**REEDFISH,** a crossopterygian ganoid fish (*Calamoichthys calibaricus*), which, with the bichir is the only survivor of a group prominent in palæozoic time, which dwells in the sluggish reedy rivers of the Senegal coast of Africa, searching the mud of the bottom for prey.

**REEDSBURG,** Wis., city in Sauk County, 150 miles northwest of Milwaukee, on Baraboo River and on the Chicago and Northwestern Railroad. It has lumber, dairying and livestock interests, manufactures woolens and flour and is a shipping point for potatoes, apples and other products. Pop. 2997.

**REEF,** the part of a sail comprehended between the top or bottom and a row of eyelet holes generally parallel thereto. The object of the reef is to reduce the surface of the sail in proportion to the increase of the wind; for which reason there are several reefs parallel to each other in the superior sails; thus the topsails of ships are generally furnished with three reefs and sometimes four; and there are always three or four reefs parallel to the foot or bottom of those main-sails and fore-sails which are extended upon booms. When a reef has to be taken in the sail is slightly lowered; the men climb out along the lower boom or yard, which they lean over, with their feet supported by the foot-ropes, fold the loose portion of the sail around the yard and tie them up with the cords inserted in the eyelet-holes. As the operation of reefing is dangerous in stormy weather many ships are now fitted up with a patent apparatus by which sails may be reefed from the deck.

Reef also implies a chain of rocks lying near the surface of the water.

**REEL,** a revolving contrivance on which fibre, thread, cord, rope, fabric, etc., are wound to form them into hanks or skeins, and for various other purposes. The term is applied in agriculture to a device having radial arms carrying horizontal slats and rotated by gear or pulley connected with the axle of a harvester, for pressing backward and holding the stalks of grain in position for being severed by the knives. In angling, a skeleton barrel attached to the butt of a fishing rod, around which the inner end of the line is wound, and from which it is paid out as the fish runs off with the bait, and is gradually wound in again as his struggles become less violent, bringing him to land or to the landing net. In baking, a cylinder with radial arms rotating in a heated chamber, carrying pans in which loaves of bread are placed for baking in the reel-oven. In cotton machinery, a machine on which cotton is wound, making hanks of thread. In domestic industry, a spool or bobbin of wood on which cotton, thread, silk, etc., is wound for use in sewing.

Also the name of a lively rustic dance in which the couples sometimes swing or whirl round, and sometimes pass, forming the figure 8. In the United States the Virginia reel was widely popular. Also the music for such dance, generally written in common time, but sometimes in jig time of six quavers to a bar. The Scotch dance known as a reel is executed by two couples, the music for which is generally written in common time of four crotchets in a bar, but sometimes in jig time of six quavers.

**REEM,** in Scriptural zoology, *Bos primigenius.* In the Authorized Version the influence of the Septuagint has prevailed, and the word is translated «unicorn,» but erroneously, as the mention of two horns on one reem (Deut. xxxiii, 17) proves. The word unicorn has disappeared from the Revised Version, wild ox being substituted for it; but in Num. xxiii, 22, the alternative rendering ox-antelope (*Oryx leucoryx*) is given in the margin. The term is still a vernacular name among the Arabs of the Sahara for a gazelle (*Gazella loderi*).

**RE-ENTRY,** legal term designating the resuming or retaking possession of lands or tenements by the landlord in case of non-payment of rent or public dues. Usually a clause providing for re-entry in case of non-payment is inserted in the lease; and under this the landlord may enforce ejectment either through notification of his wish to re-enter or, if necessary, through process of law.

**REES,** rēs, **Abraham,** English Presbyterian clergyman: b. Llanbrynmair, Wales, 1743; d. 9 June 1825. He prepared for the ministry at Hoxton Academy, where in his 19th year he was appointed mathematical tutor to the institution, and soon after resident tutor, in which capacity he continued upward of 22 years. He was pastor to the Presbyterian congregation of Saint Thomas', Southwark, 1768–83, and of a congregation in the Old Jewry from 1783 till his death. In 1776 he undertook a revision and expansion of ‹Chambers' Cyclopædia,› which he completed in 1785. The success of this work led him to a new undertaking, similar in its nature, ‹The New Cyclopædia,› in 45 volumes (1802–20), republished at Philadelphia in 47 volumes.

**REES, John Krom,** American educator: b. New York, 27 Oct. 1851; d. there, 9 March 1907. He was graduated from Columbia in 1872 and from the Columbia School of Mines in 1875. He filled the position of assistant professor of mathematics in the Columbia School of Mines 1873–76, and was professor of astronomy in Washington University, Saint Louis, 1876–81. He was director of the observatory and instructor in geodesy and practical astronomy in Columbia 1881–84, and from 1884 professor of astronomy there. He was president of the New York Academy of Sciences in 1894–96, was elected Fellow of the Royal Astronomical Society of London; and in 1901 received the decoration of Chevalier of the Legion of Honor.

**REESE,** rēs, **Michael,** American pioneer: b. Heinsforth, Bavaria, 1816; d. Germany, 2 Aug. 1878. Apprenticed to a tanner, he worked at his trade until he emigrated to the United States, and there after some reverses he established a jewelry business in which he was successful. In 1850 he went to California and began investing in San Francisco real estate. When the Fraser River excitement was at its height, Berri, a Swiss banker, disheartened as to the future of San Francisco, expressed to Reese his desire to part with his holdings. Reese having a firm belief in the coming importance of the city purchased Berri's property and thus laid the foundation of his great wealth. Among his benefactions was his gift to the University of California of the Lieber Library. The Michael Reese Hospital of Chicago, Ill., is his memorial, while his legacies to charities in the aggregate reached half a million dollars.

**REEVE, Richard Andrews,** Canadian physician: b. Toronto, 1842. He was graduated at Toronto University in 1862 and took his M.D. at Queen's University in 1865. He engaged in practice at Toronto and specialized in the treatment of the eye and ear. In 1867–72 he was assistant surgeon at the Toronto Eye and Ear Infirmary, and subsequently became lecturer on opthalmology and otology at the Toronto School of Medicine (now Medical Faculty of the University of Toronto). He was dean of the faculty in 1896–1908, when he resigned. He was president of the British Medical Association in 1905, and was then elected a life vice-president.

**REEVE, Tapping,** American jurist: b. Brook Haven, L. I., October 1744; d. Litchfield, Conn., 13 Dec. 1823. He was graduated from Princeton in 1763 and in 1767–70 was engaged as a tutor there. In 1772 he established a law practice at Litchfield, and during the war served as a recruiting officer and as a member of various committees of safety and defense. In 1784 he opened a law school at Litchfield which became justly famous and for years was without an American rival. He conducted it without assistance until 1795, when he became associated with James Gould, who succeeded him in 1820. He was a judge of the Supreme Court of Connecticut in 1798–1814, served as chief justice for a short time and subsequently served a single term in each the legislature and the council, after which he declined to hold further office. He was a Federalist, a lawyer of high ability and was the originator of the movement to secure to married women the legal right to dispose of their own property. He published ‹The Law of Baron and Femme; of Parent and Child; of Guardian and Ward; of Master and Servant,› etc. (1816), republished in numerous editions; and ‹A Treatise on the Law of Descent› (1825).

**REEVE,** a bird. See RUFF.

**REEVES, Arthur Middleton,** American philologist: b. Cincinnati, Ohio, 7 Oct. 1856; d. in railway accident near Hagerstown, Ind., 25 Feb. 1891. He was graduated at Cornell in 1878. He specialized in the study of languages and after 1879, when he visited Iceland, he devoted much of his time to European travel and the study of the sagas and ancient manuscripts. With Beamish and Anderson he wrote 'The Norse Discovery of America' (pub. posthumously 1906) Author of 'The Finding of Wineland the Good' (1890; new ed., with biography and correspondence of the author, 1895).

**REEVES,** rēvz, **Helen Mathers,** English novelist: b. Misterton, Somerset, 26 Aug. 1853. In 1876 she was married to Henry Albert Reeves, a London surgeon. 'Comin' Through the Rye,' her first story (1875), was widely popular both in this country and her own, and among her later fictions are 'Cherry Ripe' (1877); 'As He Comes Up the Stair' (1878); 'My Lady Green Sleeves' (1879); 'The Sin of Hagar' (1896); 'Becky' (1900); 'Tally Ho!' (1906); 'Pigskin and Petticoat' (1907); 'Love the Thief' (1909). Her style is pleasing and animated and the interest of her novels is well sustained.

**REEVES, John Sims,** English tenor singer: b. Woolwich, Kent, 26 Sept. 1818; d. Worthing, Sussex, 25 Oct. 1900. He studied music and, in 1832, became organist in the church of North Cray, Kent, and made his first appearance as a singer in 1839 on the Newcastle stage. He first sang in London in 1842, and having studied in Paris and Milan made his first appearance at the La Scala Theatre of the latter city as Egardo in Donizetti's opera, 'Lucia di Lammermoor.' His voice was of wide compass and great beauty — mellow and powerful, capable of the tenderest pathos and of the most stirring martial appeal, but always controlled by genuine artistic feeling and knowledge. He was heard to most advantage in the concert hall and in oratorio parts, and in such pieces as 'Guy Mannering' he displayed considerable histrionic ability. He published 'Life and Recollections' (1888) and 'My Jubilee' (1889).

**REFEREE,** *in law,* (1) a person who tries or examines an issue or question of fact sent to him by judicial order. (2) A person authorized by judicial order to take testimony and investigate on a given case. In England, under the Judicature Act of 1873, in the High Court of Justice trial before referees is ordered only on the consent of the parties or in cases in which accounts or documents are complicated and necessitate long investigation or involve local or scientific facts incapable of trial in the usual manner. Assessment of damages and inquiry and report may be ordered in any case. In the United States referees are appointed in bankruptcy cases and often in divorce proceedings, cases in which accounts are complicated and those in which secrecy is desirable.

**REFERENCE AND RESEARCH BUREAUS,** or **SCHOOL RESEARCH BUREAUS,** a type of office maintained in connection with the office of superintendent of schools, the functions of which are (1) to prepare statistical data from current reports to keep the superintendent informed as to the work of each school in the system, the relative standing of the schools and grades in educational accomplishment and the cost of operating the system; (2) to act as a clearing-house of current information, bringing the experience of other systems to the attention of local authorities; and (3) to conduct standard classroom measurements and other research work as will aid the superintendent and his supervisors in their administrative work. The object of such a specially organized bureau is to do this work during the current school term, so that the schools may make immediate use of the findings obtained and that preventive and remedial measures and economies may be put into effect during the same school year in which they are discovered. The most notable example of such a bureau is in Rochester, N. Y.

**REFERENDUM,** in the United States, the submission of the legislative acts of a representative assembly to the people for acceptance or rejection by popular vote. Under its American application, the referendum means that a specified time must elapse before a law (or, in case of a city, an ordinance) may go into effect, but if, during the period, a reasonable minority of the people should petition for a referendum on the law, it remains inoperative until after the following election, when it is either ratified or rejected by a majority of the popular votes. The period usually allowed before bills may become laws is 60 days and the percentage of voters who must sign a petition to secure a referendum varies from 5 per cent in South Dakota to 10 per cent in North Dakota. In 1906 Oregon amended her law so that the referendum might be invoked not only upon entire laws but also upon individual items or parts of laws. Every measure to be submitted to the people, on demand of initiative or referendum petitions, must be filed not less than four months before the general election. A comprehensive ballot title for each measure is formulated by the attorney-general and a campaign book is prepared by the Secretary of State. The proposed law is printed in full in this book as well as any arguments that may be advanced by the advocates or opponents of the measure, the interested parties paying the exact cost of the paper, and printing required to present these arguments. A copy of this book must be mailed by the Secretary of State to every registered voter in the State eight weeks before the general election, the State bearing the cost of printing the text of the law and postage as a legislative expense. This enables the voter to familiarize himself with the authentic details of the proposition the fate of which he is called upon to determine and allows sufficient time for discussion between individuals and by every variety of organization throughout the State. Under this device the people may kill bad laws and overthrow the work of tools of political bosses who intend to foster their private or political fortunes in the State legislative body; moreover, by a threat of invoking this remedy, much pernicious legislation can be prevented, franchise stealing eliminated and the corrupting lobby rendered unprofitable. On the other hand if the legislature exhibits indifference to public requirements and persistently refuse to enact the necessary legislation, the people have an effective remedy in the initiative (q.v.) and to a considerable extent in the recall (q.v.).

Since the 16th century a form of referendum has existed in some of the cantons of Switzerland. Under the Swiss Constitution all constitutional amendments must be ratified by the electorate before they become law. In eight cantons an obligatory referendum is in vogue, requiring the submission to the electorate of every law and every expenditure above a fixed maximum, and no demand for such submission to the electors is necessary. Other measures of national importance must be submitted to popular vote if, within 90 days after their publication, the governments of eight cantons or 30,000 votes throughout the republic should demand such submission. While the terms initiative and referendum were almost unknown in American politics prior to 1890, yet an analogy is to be found in colonial days. In the Plymouth colony, even after the towns began to send deputies to their representative legislature, the «whole body of the freemen» appeared at the June court to make laws and repeal such of the laws enacted by the legislature as appeared «prejudicial to the whole.» Even in the Massachusetts constitution of 1780 the bill of rights expressly reserved to the voters the right to instruct their representatives in the legislature, and both prior to and after the Revolution this right was freely exercised. Almost from the beginning, with a few exceptions, the State constitutions and amendments thereto have been referred to the voters of the State for ratification or rejection. (See CONVENTIONS, CONSTITUTIONAL). Some of the States have introduced another type of referendum by amending their constitutions so that legislative acts, which relate to specific subjects (such as incurring a State debt or the sale of school lands), must be subjected to popular vote. In a few States, the constitutions of which contained no such authorization, the legislatures attempted to submit to popular vote miscellaneous questions of a perplexing nature, but this practice was checked by court decisions on the ground that such action on the part of representative assemblies was an unwarranted delegation of their law-making powers. In 1901 Illinois enacted a law which might be termed an «advisory initiative,» providing that upon petition of 10 per cent of the registered voters a given proposal, such as a «question of public policy,» must be submitted to the electorate of the entire State. A similar law has been passed in Delaware and several other States.

The first referendum league in the United States was organized in New Jersey in 1892 but South Dakota was the first State to adopt the optional or facultative referendum, the necessary amendment to the constitution being adopted in 1898. Her example was followed by Oregon (1902), Nevada (1905 and 1912), Montana (1906), Oklahoma (1907), Maine (1908), Missouri (1908), Arkansas (1910), Colorado (1910), Arizona (1911), New Mexico (1911), California (1911), Idaho (1912), Nebraska (1912), Ohio (1912), Washington (1912), Michigan (1908 and 1913), Massachusetts in a limited form (1913), North Dakota (1914), Maryland (1915) and Mississippi (1916). In 1900 Utah and in 1912 Idaho adopted amendments providing for the initiative and referendum, but the legislatures have not passed enabling acts; New Jersey is experimenting with the referendum in cities and in 1916 Minnesota rejected the plan. The Oregon amendment was bitterly attacked by its opponents who took the matter to court, where a minor judge declared the measure unconstitutional and not in accord with the provisions of the Federal Constitution. Appeal was taken to the Supreme Court of the State which tribunal not only reversed the decision of the lower court, but held that the referendum «does not abolish or destroy the representative form of government or substitute another in its place. The representative character of the government still remains.»

In 1897 the Nebraska legislature enacted a law permitting the cities of that State, upon the vote of a majority of their citizens, to adopt direct legislation methods in the conduct of their affairs. In the same year Iowa extended the initiative to all questions of franchise save those of public ownership. Many Western cities have adopted the direct legislation reform, beginning with Seattle, Wash., in 1892, this city being quickly followed by Buckley, Wash., Alameda, Vallejo, San Francisco, Sacramento, Los Angeles, San Diego, Pasadena and many of the smaller cities of California; Portland, Ore., Grand Rapids and Detroit, Mich., Denver, Des Moines, Minneapolis, Nashville and others. Altogether the initiative, referendum and recall are used more or less completely in about 300 municipalities, some under general State laws and some under special charters. See INITIATIVE; RECALL.

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**REFINING,** *in metallurgy,* the last step in the purifying of gold, silver, tin, copper, lead, etc. Gold and silver are commonly mined together, and are sent from the smelters in bullion bars of mixed metal. It is the work of the refinery to part or separate this mixture into pure gold and silver. Both nitric and sulphuric acid are used in parting. In refining iron, the process has been developed on several lines, as converting and puddling. See METALLURGY; ASSAYING; GOLD; SILVER, etc.

**REFLECTING GALVANOMETER,** a most sensitive galvanometer, devised by Sir William Thompson for use in connection with the Atlantic submarine cables. A short needle is rigidly attached to a small concave mirror and suspended by a silk fibre in the centre of a vertical coil of small diameter. This mirror is adjusted by means of a directing magnet to throw the rays of light (falling on the mirror through a hole having a fine wire stretched upright across it and placed just under the graduated scale opposite the mirror) back on the scale. An image of the wire is thus thrown on the scale, and the slightest motion of the needle and its mirror will produce a much greater motion of this image.

**REFLECTION.** See LIGHT.

**REFLECTIONS ON THE REVOLUTION IN FRANCE,** published in 1790, remains to-day one of the most interesting and important of the writings of Edmund Burke (1729–97). The immediate object was an answer to a famous sermon which Dr. Price had preached in favor of the Revolution, but it amounts to a very comprehensive indictment of the entire revolutionary movement. Regarding the issue as of unparalleled importance, Burke devoted the greater part of the year to the preparation of the book. The spirit animating him was his dislike of revolution in comparison with the slower and less disrupting processes of reform. As such, the book has been cited (cf. Lord Hugh Cecil’s ‘Conservatism’) as the Bible, primer and textbook of modern British conservatism, as the most distinguished commendation of the principles which dominated the present Conservative party in England, at least up to the outbreak of the World War. The book is a great philippic and jeremiad against the spirit of revolution in general and the French Revolution in particular. It is replete with sound, sober principles on the one hand and warnings and prophecy of disaster on the other. Many of these prophecies were justified by the Napoleonic event, and Burke’s wisdom appears in very favorable and dignified light. The ‘Reflections’ were written with great care and elaboration in Burke’s most weighty style, and no one of his writings is more replete with political philosophy and striking aphorism. He discusses such fundamental matters as the use of prejudice, superstition and power as forming valuable assets in government. Some of these passages are famous, such as his diatribe against revolutionary finance or his analysis of the principles of the great bad men like Cromwell; but the most resplendent paragraph in the book is that describing the Dauphiness and lamenting the decay of chivalry in the world. John Morley’s ‘Burke’ gives the best short account of the ‘Reflections’ and their relation to Burke’s other writings.

WILLIAM T. BREWSTER.

**REFLECTOR,** a smooth polished surface by which the rays proceeding from a luminous or heated object are thrown back or diverted in a given direction. The reflecting surface may be either plane or curved. In practice it is often made spherical or parabolic. The former does not bring the rays to a true focus, but is easily formed, and is consequently generally employed where extreme accuracy is not sought for. A mirror is a familiar example of a plane reflector. The reflectors of lighthouses have been very highly developed. (See LENS; LIGHT; LIGHTHOUSE). In telescopes, where a reflector is used the entire instrument has come to be known as a reflector. See TELESCOPE.

**REFLEX ACTION,** a non-voluntary reaction affecting a muscular apparatus in response to some kind of sensory stimulus. Such a reaction implies the traversing of the sensory stimulus to some nerve centre or centres in the brain, the medulla, or the spinal cord, and the setting free of a muscular response, general or local, to certain organs of the body, without the participation of willed conscious action, although consciousness of a reflex act performed may precede or accompany the act. Many of these reflexes are extremely intricate, so intricate in fact that certain philosophers have attempted to show that all life-processes are of the type of reflex actions. Many reflex actions, by reason of the fact that their muscular equivalent acts on blood vessels, may increase or decrease glandular activity. This fright may destroy the ability of the stomach to digest. Dryness of the mouth is frequent as a result of certain forms of unconscious excitement, and many if not all of the emotions may be regarded materially as intricate forms of vasomotor reflexes. Further reflexes are constantly operative and affect the normal metabolism of the skin or the bones, and still others are concerned in the general nervous equilibrium of the entire body — the so-called neuromuscular tone. See CONSCIOUSNESS; EMOTION; MUSCLE-SENSATION; NERVOUS SYSTEM; TELEPATHY.

**REFORESTATION.** See FORESTRY.

**REFORM ACTS.** See REFORM BILLS.

**REFORM BILLS,** in English history three bills, introduced in 1832, 1867 and 1882, for the purpose of increasing the electorate for the House of Commons and removing certain inequalities in representation. The first Reform Bill disfranchised many boroughs which enjoyed undue representation and increased that of the large towns, at the same time extending the franchise, and was put through by the Liberals. The bill of 1867 was passed by the Conservatives under the urging of the Liberals, while that of 1882 was introduced by the Liberals and passed in 1884: these two provided a more democratic representation. See GREAT BRITAIN; POLITICAL PARTIES; PARLIAMENT.

**REFORM JUDAISM.** See JEWS AND JUDAISM — REFORM JUDAISM.

**REFORM MOVEMENTS IN POLITICS.** See ELECTORS; VOTE, VOTERS, VOTING; CORRUPT PRACTICES ACTS; CIVIL SERVICE REFORM; UNITED STATES — THE NEW DEMOCRACY AND THE SPOILS SYSTEM; LABOR LEGISLATION; PROHIBITION; PRIMARY, DIRECT; PRIMARY PRESIDENTIAL PREFERENCE; ELECTORAL FRAUDS AND SAFEGUARDS AGAINST; INITIATIVE; REFERENDUM; RECALL; WOMAN SUFFRAGE.

**REFORMATION, The.** The Reformation was the movement in the religious life of western Europe in the 16th century which resulted in the formation of the Protestant Church. At earlier periods there had been a feeling that conditions in the leadership of Christendom needed improvement and attempts at betterment were made along two distinct lines. The first was through the efforts of individual men, monastic orders and general councils to bring about changes for the better within the Church. Such a movement was undertaken by the Reforming Councils of Pisa, Constance and Basel in the 15th century where an unsuccessful attempt was made to reform the Church in head and members. The second way in which efforts had been made to improve the condition of Christendom was to form separate organizations outside of the Roman Catholic Church such as the Albigenses and Waldenses. These early separatist movements were not of any great importance because they affected only a comparatively small number of the Christians of Europe. These efforts to reform the Church from within and to establish other churches outside of Roman Catholicism had not met with success as the 15th century came to its close. The papal chair had been occupied for half a century by men who were more interested in the revival of learning and Italian politics than they were in giving Christendom the kind of leadership which it needed. Some of the popes contributed largely to the success of the Renaissance. Some were indifferent to religion and of immoral lives. The Reformation of the 16th century started as an effort to bring about reforms within the Roman Catholic Church, and it was only after this seemed impossible that the leaders withdrew from organized Roman Catholicism.

There are a number of reasons why the separation from the Church and the formation of a new organization met with success in the 16th century when the earlier efforts had failed. Most important of all was the revival of learning. Men were thinking for themselves as they had not before for centuries. The invention of printing brought about wide diffusion of knowledge. There was an opportunity through the study of the writings of the Early Church fathers to compare the Church of the first centuries in its belief and organization with the Church of the 16th century. It was evident to students that there was a wide difference between the two. The circulation of the New Testament also tended to bring about a diversity of opinion on religious matters. There was a growth of the national feeling in some of the nations of Europe, and an increasing desire that ecclesiastical affairs be handled within the nation rather than by the distant papacy, especially as the popes were involved in European politics. There was also a group of men who were fitted for leadership in the establishment of a separate Church. These men were able to accomplish what they did because of the growing consciousness that the Church as then organized and governed was not meeting the needs of the times, nor was it furnishing the moral and spiritual leadership which it had given in earlier centuries.

The Reformation began in Germany through the work of Martin Luther. A peasant by birth and a university graduate, he desired to make sure of his own salvation. He became an Augustinian monk and practised all the austerities of the order but did not find assurance of salvation. Through the help of friends in the order, by his study of the German mystics, and especially through the study of the New Testament he came to the belief that a man is not justified by works but by faith alone in Jesus Christ. Justification by faith came to be the foundation of his theology. He became professor in the University of Wittenberg and preached in that city. While he was here, the indulgence seller, Tetzel, began his work near Wittenberg and Luther preached against the sale of indulgences because it was contrary to his conception of salvation by faith in Jesus Christ. On 31 Oct. 1517 he posted his 95 theses, in this way stating his own position on the subject and challenging to a debate. This brought him into conflict with the papal authorities and it was found that there were great numbers in Germany who accepted his views. Efforts were made to bring him back to the Church but in vain. His further study of the New Testament and the Church Fathers led him to take views directly antagonistic to the papacy. He taught that a general council could make mistakes, that all Christians were priests before God and that in matters of doctrine the papacy had departed from the teachings of the Bible. He was excommunicated and at the will of Emperor Charles V, placed under the ban of the empire but continued to be the leading spirit in the German Reformation. His most important assistant was his fellow-teacher at Wittenberg, Phillip Melancthon, the thinker and scholar of the Reformation as Luther was the aggressive leader. The Reformation spread rapidly after 1517 but was somewhat checked in 1524–25 by the Peasant Revolt because, in the minds of many, Luther's preaching led directly to such outbreaks. Luther's marriage also alienated some of his followers who did not believe that monastic vows ought to be broken. Efforts were made repeatedly at the German diets to come to some agreement but in vain. Feeling between Catholics and Lutherans became more bitter till war broke out between them, which was settled by the Peace of Augsburg in 1555 by which it was agreed that each prince should have it in his power to decide the religion of his people. The principle was expressed in the words *cujus regio ejus religo*. Another part of the agreement was the Ecclesiastical Reservation, according to which if an ecclesiastical prince changed his religion he must resign his benefices. This settled the ecclesiastical question in Germany for nearly a hundred years, but was unsatisfactory because it gave no room for the growing numbers of Christians outside of the Catholic and Lutheran bodies.

Meanwhile a similar movement was going on in Switzerland under the leadership of Ulrich Zwingli. He was a humanist and a great admirer of Erasmus. His study of the Bible led him to question some of the teachings of the Church and while preaching at the cathedral at Zürich he presented his new views. To settle the kind of preaching which should be allowed at Zürich a public disputation was held and the city government decided in favor of the Reformation. Similar action was taken by other cities of German Switzerland. The Lutheran and Swiss reformatory views were much alike, but with some striking differences. In order that there might be united and harmonious action by the two, a conference was arranged between the leaders of the two divisions at Marburg in 1529. They could agree on all points except on the Lord's Supper, the followers of Zwingli looking upon it as a memorial, while the Lutherans insisted upon the literal sense of the words, «This is my body,» holding to the actual presence of the body and blood of Christ in the bread and wine but not to the change of the elements into the body and blood. All later attempts to bring about an agreement between the Swiss or Reformed branch and the Lutherans failed. The Swiss forest cantons remained Catholic while the city cantons accepted the Reformation. There were other disagreements of a political nature so that war broke out and Zwingli was killed at the battle of Cappel in 1531. Zürich continued to be important as a centre for the propagation of the Reformation, but the leadership of the Reformed Church passed to Geneva.

There were many who believed that the Lutherans and Reformed did not go far enough in their rejection of error, and dependence upon the New Testament. These radical reformers were known as Anabaptists, because most of them rejected infant baptism and held that believers only should be baptized. They varied in life and belief from the learned and saintly humanist, Hubmaier, to the fanatic, John of Leyden. They were persecuted by Protestants and Catholics and many of them died as martyrs. The worst side of the movement appeared in the city of Münster, where an Anabapist kingdom was established and polygamy was introduced. The large majority of the Anabaptists were sincere Christians, intent upon following the simple teaching of the Bible. They are the spiritual ancestors of millions of our present-day Christians.

In France there was no leading figure in the early days of the Reformation corresponding to Luther and Zwingli. The nearest approach to this was Jean Jacques Lefèvre, better known perhaps by his Latinized name, Faber Stapulensis, who was the leading humanist of his day in France. He came to a belief in justification by faith rather than by works before Luther did, and his translation of the New Testament into French greatly aided the Reformation. One of his pupils was Briçonnet, bishop of Meaux, who undertook reformatory work in his own diocese and invited preachers of Reformed views to assist. He never went so far as to break with Roman Catholicism and when protests were made against the preachers he had brought in he ordered them to withdraw. But the work which had been begun went on in secret in Meaux and in other parts of France. Faber never withdrew from the Roman Catholic Church.

The attitude of the French king, Francis I, varied from time to time according to political exigencies, but became more hostile to Protestantism as time went on. He was greatly disturbed by the Peasant Revolt in Germany, fearing that the spread of the new faith might bring anarchy into his own country. In his closing years the laws against heresy were rigidly enforced but Protestantism continued to spread. The great growth of Protestantism in France came after the Frenchman, John Calvin, became master of Geneva and made that city the centre of the Reformed branch of Protestantism. Frenchmen went to Geneva and returned to their homeland to distribute copies of the New Testament and to preach, when they knew that they risked their lives by so doing. The persecuted Christians were organized into churches under the direction of Calvin. The Presbyterian system was established and even in the days of persecution a national organization was effected. The French Protestants were called Huguenots and became a political as well as religious party. As in so many other nations of Europe, war broke out between the followers of the two faiths. These wars succeeded each other rapidly for a period of half a century with varying results. Finally Henry of Navarre became king. He was a Protestant, but to put an end to the civil wars he became a Roman Catholic. In 1598 he published the Edict of Nantes which gave a limited toleration to the Huguenots and under which they increased in numbers for nearly a century.

A second and more important branch of the French Reformation was that which had Geneva as its centre. Geneva had accepted the Reformation principally through the efforts of French evangelists of whom William Farel was the leader. He attempted to make the people of Geneva live up to their professions but was unable to do so. The work which he began was carried on by John Calvin in such a way that Geneva became the model city of Protestant Christendom. John Calvin was famous before his coming to Geneva as the author of the 'Institutes,' a book which more than any other became the textbook of the Reformed Church. Calvin fled from France because of the persecution and hoped to find some city where he could spend his life in scholarly work for the Reformation. On his journey he chanced to come to Geneva to pass the night. Farel was trying to organize the Church and he persuaded Calvin to assist him. After a prolonged conflict Calvin gained control of the city. He reorganized the Church under the eldership system by which ministers and lay elders had control of the spiritual affairs of the city. He established theological lectureships, thus making possible an educated ministry. Geneva became the educational centre of the Reformed Church and large numbers of men, fleeing from persecution in England, the Netherlands, France and other parts of Europe, came to Geneva, studied under Calvin and carried his theology and form of Church organization back to their home lands.

The Reformation came early into the Netherlands because of its close commerical and political connection with Germany. Charles V attempted to put a stop to the spread of the movement but the laws against heresy were not executed with strictness in his reign. His son Philip II entered upon a more vigorous policy of persecution and through the Duke of Alva and his successors tried in vain to suppress the political and religious liberties of the Netherlands. The great leader in the struggle for independence was William of Orange, at first a Catholic and in his later years a member of the Reformed Church. The inquisition of the Spanish type was introduced and the laws of the country were suspended. Persons accused of heresy were executed by the hundreds. Philip resolved to root out heresy even if it meant the ruin of the country. In vain the best generals in Spain were sent to overcome the resistance of the people. Under the guidance of William of Orange the northern provinces which were almost wholly Protestant declared their independence of Spain, which was finally established at the close of the Thirty Years' War.

England had been influenced by the Humanistic movement through the work of More, Colet, Erasmus and other leaders of the Renaissance but their effort was rather to purify the Old Church than to form a separate organization. The immediate cause of the separation was the act of the king who desired a divorce from his queen, Catherine. The Pope was not willing to grant this and so Henry took the matter into his own hands and declared himself the supreme head of the Church of England, obtaining his divorce through Cranmer, archbishop of Canterbury. Parliament, under the control of Henry VIII, passed a law which took all authority in England away from the Pope and the king became supreme in all matters relating to the temporal affairs of the Church in England. No appeal could be taken on any ecclesiastical matter to any power outside the realm. It was the plan at first to make no changes in doctrine but there was a strong Protestant tendency under the leadership of Archbishop Cranmer. This was made evident by the publication of the Ten Articles which formed the first statement of belief of the separated English Church. Henry encouraged the reading of the Bible because he thought this would strengthen the movement away from Rome, not realizing that the study of the Bible would bring independence and diversity of belief amongst his people. There was a strict understanding that all the people should walk in the ecclesiastical path which Henry had marked for them. Those who refused to do so were subjected to the king's displeasure and in a few instances were executed for refusing to acknowledge him as supreme head of the Church in England or for declining to follow him in his doctrinal changes. One of his most drastic changes was the dissolution of the monasteries. A royal commission was appointed to investigate their condition and this commission brought in an adverse report so that they were dissolved, the smaller ones at first and the larger ones later in his reign. The property of the monasteries was used in part for educational and religious purposes but the larger part was used to enrich the king and the landed gentry. Henry's reign closed in 1547, and he was succeeded by his 10 year-old son, Edward VI, who because of his youth was under control of regents. The movement toward a Reformation of the Continental type was rapid in his reign under the leadership of Cranmer. Theologians from the Continent were brought in to assist in the movement. The first Prayer Book of Edward VI was published largely through the influence of Cranmer. This is the basis of the present Book of Common Prayer. Forty-two articles of Faith, afterward reduced to Thirty-nine, formed the doctrinal basis of the Church.

In 1553 Mary the daughter of Henry VIII and Catherine became queen and attempted to undo all that had been done in the direction of Protestantism in the preceding reigns. She tried to have the men who had been enriched by the abbey lands give back these lands to their former owners, but in this she did not succeed. The nation returned to allegiance to the Pope with an ease that made it clear that England was not yet ready for the change to Protestantism. Mary enforced the heresy laws, especially against those who had been prominent in the overthrow of Roman Catholicism, some of the leading Churchmen of England being included in the list of her victims. The fortitude of these unfortunate ones as they were burned at the stake did much to turn the minds of England to a study of the Reformation. More and more in the reign of Mary, England was becoming Protestant and the queen had the consciousness in her closing years that her efforts to turn the nation to the Old Church had been a failure. When Elizabeth succeeded to the throne in 1558 she found conditions which required the exercise of great wisdom to keep the nation from civil war. She was herself a Protestant by taste if not by conviction. The changes introduced by Mary were quickly abolished. A new Act of Supremacy was passed which made her Supreme Governor on Earth of the Church in England. With her accession the Protestant leaders who had fled to the Continent when Mary began her prosecutions came back and brought with them ideas which were in conflict with the thoughts of Elizabeth in regard to the royal supremacy. These Puritans as they came to be called were not opposed to the idea of Episcopacy but they did object to what they considered the remnants of popery in the system which still retained forms and customs suggestive of Roman Catholicism. They desired a State Church purified from all that had suggestion of popery and one in which there was a large degree of freedom in the way of forms and ceremonies. In the later years of Elizabeth there was a party believing in Presbyterianism as the only proper form of Church government and they desired to have one established State Church but of the Presbyterian type. There also appeared the various independent movements out of which the Congregationalists and Baptists later arose.

While we associate John Knox more than anyone else with the Reformation in Scotland, there were several men who prepared the way for him. One of these was Patrick Hamilton, a young nobleman who studied at different universities on the Continent and came to the Protestant position. He returned to Scotland and preached the new views. Cardinal Beaton was primate of Scotland and resolved to suppress heresy. Hamilton refused to change his views and was burned at the stake. George Wishart was another enthusiastic preacher of the Protestant views. He was protected by the nobles who were friendly to his teachings and he made evangelistic journeys in different parts of Scotland. One of his followers was John Knox. Wishart was captured and executed for heresy and Knox became the leader of the Scotch Reformation. He had obtained a priestly education and soon showed marked ability as a Protestant leader. He worked in England in the reign of Edward VI and went to the Continent when the persecution broke out in the reign of Mary. He studied at Geneva and adopted Calvin's views in regard to Church organization and theology. On his return to Scotland in 1559 he became virtually the head of the Protestant movement in that country. He gave his support to the Lords of the Congregation in their attempt to maintain Protestantism against the wishes of Mary Stuart, who desired to hold the nation to Catholicism. The conflict resulted in a victory for Protestantism and Presbyterianism was established by law. After Knox's death in 1572 his work was ably carried on by Andrew Melville.

The Reformation was also introduced into Denmark, Sweden and Norway. The leaders were men who had been pupils of Luther and the Reforamiton was under state control. It was in some cases forced upon the people before they had been thoroughly informed of the meaning of the change. Educational work was carried on later so that the Scandinavian countries became thoroughly Protestant.

The Lutheran Reformation also extended into Bohemia, Hungary and Poland. In Bohemia the way had been prepared by Huss and his followers. It spread rapidly here but was almost entirely overthrown by the work of the Jesuits and the Thirty Years' War. In Hungary and Poland the progress of the Reformation was greatly hindered by the rivalries of Lutherans, Calvinists and Unitarians.

Attempts were made by the Roman Catholic Church to recover the ground lost and to gain new territory in the non-Christian world. The principal agency in this effort was the Society of Jesus, an organization founded by the Spanish monk, Ignatius Loyola. The new religious order placed itself under the power of the Pope to be used unreservedly by him in the service of the Church. It worked along two lines — educationl and missionary — and was so successful that in some parts of Europe the Reformation was held in check, in other places large numbers who had been Protestants were won back to Catholicism. In non-Christian lands the members of the Society worked as missionaries and thousands were won to Catholicism. (See COUNTER REFORMATION). Consult Fisher, 'History of the Reformation' (1893); Newman, 'Manual of Church History' (1903); Walker, 'The Reformation' (1900); Lindsay, 'History of the Reformation' (1907); 'The Reformation' in the 'Cambridge Modern History' (1907).

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**REFORMATORIES.** See PENOLOGY.

**REFORMATORY SCHOOLS,** schools instituted for the training of juvenile offenders who have been convicted of an offense punishable by imprisonment. The first reformatory managed under legislative control was the one established in New York in 1824, known as the New York House of Refuge. Its success was so marked that at present there are 56 institutions in the United States for the reformation of juvenile offenders. Among them are a number of admirably conducted establishments under the control of religious denominations, to which children are sent, according to the religious creed of their parents, when the same can be ascertained.

**REFORMED CATHOLIC CHURCH,** a religious body established in New York in 1879 by several priests who had left the Roman Catholic Church, and under the leadership of Rev. James A. O'Connor. It adopted the Protestant doctrine as expounded in the Evangelical churches, and protested against the doctrine, government, discipline, practice and sacramental system of the Roman Catholic Church. They believe that the believer finds salvation through faith in God through Christ and needs no mediation through the church. They have six churches, eight ministers and about 3,000 members. The sect is established in New York, Massachusetts, Pennsylvania and Illinois.

**REFORMED CHURCH.** See Calvin, John: Calvinism; Reformed Church in America; Reformation.

**REFORMED CHURCH IN AMERICA, The,** is one in denominational polity and doctrinal type with the Reformed Protestant Dutch Church of the Netherlands, and bore that name until the year 1867. The beginnings of distinctive Reformed Church theology should be credited to «The Brethren of the Common Life.» This was a unique organization of Christian community-life throughout the Netherlands, indirectly inspired by the consecrated mystic, John Ruysbroek of Brussels, designed and formally established at Deventer and Zwolle in North Holland by Ruysbroek's devoted pupil and friend, the enthusiastic evangelist-missionary, Gerard de Groote, in the last year of his life, 1384, and fully organized and developed by de Groote's like-minded fellow-worker, Florentius Radewyn, during the last 16 years of the 14th century, which were also the closing and crowning years of the life of this truly diligent and admirable man. Absolute loyalty to the will and person of the Lord Jesus Christ in everything, as necessarily exemplified in continual personal study and obedience of the Holy Scriptures, was the one all-important purpose in the daily life of these single-hearted Christian leaders. For the more practical and complete realization of their one supreme purpose many varied personal and community activities were developed; conspicuous among these were transcribing and multiplying copies of the Old and New Testaments, the early Church Fathers and other truly good books; the grouping of these «copyists» in community-families of not more than 20 persons under the same roof; daily study of the Scriptures, the classic languages and the simpler sciences; the establishing and employing of schools, academies and colleges for the educating of the youth; providing needed teachers as well as needy students in already flourishing schools — with the special design of encouraging and helping every ambitious boy to an education anywhere in the Netherlands; and daily, ordered and useful *work* of some kind for every person; for preaching Christ and Christian duty, teaching, publishing, farming, gardening, sharing handiwork of any and every useful kind, made up the regular program of the «Brethren of the Common Life.» This carefully organized Christian system, during the century preceding the dawn of the great Reformation, produced such men as Thomas a'Kempis, saintly author of 'The Imitation of Christ'; Rudolph Agricola, famous for reviving classical studies and freeing learning from scholastic fetters; Alexander Hegius, the greatest educational reformer of his age; Desiderius Erasmus, the foremost humanist, scholar and author of the Renaissance; and John Wessel, more popularly known as Wessel Gansfort, philosopher, physician and pioneer organizer of the earliest Protestant theological system.

Besides these eminent men, the schools of the «Brethren of the Common Life» trained a great number of lesser leaders, who were influential for better things in education, and morals and spiritual life. De Groote and Florentius appreciated the value of the spiritual treasures bequeathed to them by the greatest of all the mystics, Ruysbroek, the venerable abbot of Gruenthal, and Tauler, the impassioned evangelist of the Rhine Palatinate; and realizing clearly the supreme crisis of their time, and their own supreme obligation through the service of fellow-men to seek the greater glory of God, they established wisely and permanently their efficient brotherhood of Christian communities, which directly for nearly two centuries, and indirectly for all succeeding time, was influential in making Holland pre-eminently the home of civil, intellectual and religious liberty. And to these founders and trained leaders of the «Brethren of the Common Life» the Reformed Church in Holland and in America is indebted — above all others — for a religious faith always scriptural, simple and spiritual, which exalts to supreme place the salvation and imitation of the Divine Redeemer, the imperial authority of Holy Scripture, the Fatherhood of God and the true love and service of mankind. These men in Holland shared with Wyclif of England and Huss of Bohemia the honor of faithful preparatory work in the 14th and 15th centuries as evangelical reformers *before* the Reformation.

Early in the development of 16th century reform the people of Holland showed marked preference for the doctrinal system of Zwingli and Calvin rather than that of Luther. This may have been partly due to their long-time neighborly intercourse and friendship with the Evangelicals living on the banks of the Rhine, and partly due to their sympathy with the persecuted disciples of Calvin in France; but chiefly due, it may well be urged, to the clear, convincing and fearless propaganda of Wessel Gansfort — a man of such culture, conviction and persuasive power that his two years' professorship at Heidelberg University established a virile and abiding evangelical influence in those academic halls which had marked effect upon Ursinus and Olivianus and the Heidelberg Catechism. Without doubt also Gansfort directly, or indirectly, helped to shape the Belgic Confession as truly as that great symbol influenced the countrymen of Gansfort in later years. It may be remembered that Martin Luther himself wrote concerning the writings of Gansfort: «If I had read his works earlier, my enemies might think that Luther had absorbed everything from Wessel, his spirit is so in accord with mine.»

The persecutions for heresy under Charles V of Spain (1519–55), and his son Philip II (1555–98), brought long-continued distress and suffering to the Netherlands people, and continued with occasional brief intervals for more than half a century. The period of horrors, par excellence, was the bloody six years' régime of Alva (1567–73), during which time, as the princely butcher boasted, there were more than 18,000 authorized executions; and it is claimed that in this little country more than 100,000 persons gave up life rather than faith. The more cruelly they were persecuted, however, the more inflexibly the Hollanders refused the obedience their Spanish king demanded. In 1584 William of Orange, the shrewd, self-sacrificing, invincibly fearless and confident defender of Holland's faith and freedom, was treacherously assassinated by Balthazar Gerard; yet his son Maurice proved himself a skilful military leader, and with some little help from

England the struggle with the oppressor continued for some years; but finally in 1609 the «twelve years' truce» was agreed upon and Holland's long-protracted agony for conscience's sake was over. Yet during the darkest days of persecution proscribed evangelists continued their fervent preaching in the fields, and the people prayed and sang praises to God, after the example and spirit of the imprisoned apostles — the appeals of the field-preachers and the inspiring hymns of Beza and Marot continually strengthening them all to persevere in «witnessing a good confession.»

Just before the coming of Alva, in 1566, a few Dutch and Walloon pastors organized the first evangelical Church Synod at Antwerp; and with the aid of a few noble laymen a complete Church organization was effected. The Belgic Confession, written by Guido de Brey five years before, was adopted, with slight changes; and the Heidelberg Catechism, now for three years the authorized symbol of the Palatine reformers, was accepted tentatively, to be fully and finally adopted a few years later. Yet it was distinctly professed, whatever doctrinal standards were honored or endorsed, that the Word of God was the only recognized rule of faith. The Synod of Wesel in 1568 somewhat modified and adopted Calvin's Presbyterian polity; the necessity for a learned and consecrated ministry, loyal to the Word of God and the Church standards, was plainly set forth, and the various classes and duties of church officers were clearly defined. In 1571 came the Synod of Emden, which endorsed the acts of previous synods and formulated certain new features of church government. The first Synod of Dort, 1576, defined the four grades of ecclesiastical bodies as follows: the General Synod, the highest court, its members delegated from the Classes, and meeting once a year; the Particular Synod, also a delegated assembly of ministers and elders, meeting annually; the Classis, a permanent body including the pastors and one elder each from a number of nearby churches, and meeting twice a year, and the Consistory, the court of the individual church, consisting of an equal number of elders and deacons elected by the church, with the pastor as president. The same Synod also limited certain conditions of church membership. Five years later the Synod of Middleburg assembled in 1581 to complete the organization of the Church and to determine certain matters relating to schoolmasters, professors of theology, liturgy and creed. A month later the sovereignty of Philip II was formally renounced, and the Reformed Church was declared the established Church of the Netherlands. The great Arminian controversy early in the 17th century made necessary the calling of the second Synod of Dort in 1618, to which all the Reformed Churches of Europe were invited, and most of them consented, to send delegates. James I commissioned as England's representatives the bishop of Llandaff, Samuel Ward, professor of Cambridge, and Joseph Hall, afterward a bishop of Salisbury. Foreordination, perseverance of the saints, man's conversion and free will and the divine atonement were elaborately discussed; under the leadership of Episcopius (Arminius having died before the Synod convened), the Remonstrants warmly favored the system of Arminius, which, in certain points, was finally adjudged contrary to sound doctrine; the Arminian Remonstrants were excluded from office in the Reformed Church, as consciously and wilfully traversing their own solemn pledges of loyalty to the Church and its standards; and in an elaborate formula known as the «Canons of the Synod of Dort,» the Synodal decisions concerning the great doctrines of grace were carefully defined. The «Post Acta» of the later sessions of the Synod set forth authoritatively certain important details concerning the call to the ministry, festival days, hymns for worship, baptism of adults and the sick, professors of theology and their relations to the Church, a new translation of the Bible into Dutch, foreign missions, the Liturgy and ministers' salaries. The Heidelberg Catechism was again heartily adopted, and a «Compendium» of its teachings was prepared that it might be included with the other standards of the Church.

Four years before this time the Hollanders began emigrating to America; for that new-discovered world became increasingly attractive year by year, since the Holland government had formally annexed the country discovered and partially explored as «New Netherland,» and had issued a charter to the East India Company, with specified rights of trading, settling and colony improvement. Within a half dozen years after Henry Hudson, in 1609, had discovered the river that bears his name the Dutch trading posts at New York and Albany had the services of specially qualified and ordained Christian laymen (Jan Huyck and Sebastiaen Jansen Krol by name) as «Comforters of the Sick» and leaders of public worship on Sundays. A distinctly aggressive religious influence was also due to the consecrated personality of the first director of the colony, Peter Minuit, who had been for years an ordained elder of the French Reformed Church of Wesel.

In seeking their comfort and growth, spiritual as well as temporal, at both Albany and New York, these three Christian laymen served their fellow-colonists for some years *before* the coming of the first missionary minister of the Dutch colony, the Rev. Jonas Michaelius, in the year 1628. Soon after the coming of this minister the first Reformed church was organized with 50 communicants. Many of the early settlers of New Netherland were French Huguenots, more commonly called «Walloons.» The name of the Long Island locality, «Wallabout,» shows the nationality of most of the people who settled there. In 1642 the people of Albany (Fort Orange) were no longer obliged to content themselves with the spiritual ministry of the «Comforters of the Sick,» for Kiliaen van Rensselaer, the first patroon of Rensselaerswyck, secured for them the services of a well-qualified minister, the Rev. Johannes Megapolensis, and in August of 1642 the first minister of Albany began his seven years' pastorate. It is worthy of note that the Classis of Amsterdam (having sole ecclesiastical jurisdiction over New Netherland), which commissioned Megapolensis for his work, also specified in his «call» that his duty was to minister to the spiritual needs of the Indians as well as the Dutch, and the same duty was prescribed in many other Classis «calls,» which served as official commissions of the ministers for their work, whether on the Hudson River, the Delaware, the Mohawk or the Raritan. Early in his ministry at Albany Megapolensis prepared and published a detailed account of the Mohawk Indians, one of the earliest trustworthy books on the life, customs and characteristics of the American Indian. In 1654 a third Reformed church was organized at Flatbush, L. I., with Polhemus as pastor; and other churches were established during the next 10 years, so that at the time of the English occupation in 1664 they numbered 13 in all.

During the next century the need of ministers for the steadily growing American church became more and more urgent; there were no American colleges and seminaries available to prepare students for ministerial service; but few young men could afford the time and expense necessary for seven years of academic and theological study in Holland; and the Reformed Church was thus hindered and dwarfed in the most important stage of its growth. Another condition limiting the increase of the Church was the continued and exclusive use of the Dutch language for more than half a century after it should have been clear to any thoughtful person that this persistent stand of the Dutch Church was a steadily losing policy which must finally bring disaster. Whether among Dutch settlers in America of the early 17th century or among German settlers in America of the early 20th century — to make the language of the street, and social life and business, the language of the school, the newspaper and the Church, is evidently a policy profitable, sensible, Christian and patriotic.

Another obstructive influence, which co-operated all too well with the injurious tendencies already noted, was the propaganda of many leading Episcopalians, crafty or aggressive, persuasive or argumentative, but at all times persistent, which often triumphed, in capturing from the Dutch Church many of her most wealthy and influential communicants. Yet another influence, most lamentable of all in its injury of vital interests, was the long «Coetus-Conferentie» controversy, which seriously crippled and divided the Church from 1755 to 1771. Harmony was at last restored through the wise and gracious activities of Dr. John Henry Livingstone. He was a graduate of Yale College, and later of the theological department of the University of Utrecht, Holland; and he brought with him, as a Dutch doctor of divinity set apart by the Classis of Amsterdam as minister of the Collegiate Church of New York, a most valuable content of influence in the approving counsels and hearty co-operation of the churches of Holland in his plan for reconciliation and peace. (The adoption of the Plan of Union virtually removed the American Church from the jurisdiction of the Classis of Amsterdam; 21 years later absolute independence came with the new constitution). Dr. Livingstone later in life was professor of theology in the New Brunswick Theological Seminary for many years (1784–1825), and 15 years before his death he was also elected president of Rutgers College. Long-cherished plans for a Church college were realized when Governor Franklin granted a charter in 1766; but Queens College (later Rutgers) was organized under a second and improved charter in 1770, and was permanently located in New Brunswick, N. J. Besides the theological seminary at New Brunswick, the Reformed Church has a second theological seminary at Holland, Mich., and a third in connection with the Arcot Mission of the Reformed Church in India.

Near the middle of the 19th century there was an extensive immigration from Holland to Michigan and the neighboring States; and the rapid growth of this large Holland colony led to the founding of Holland Academy, which afterward so steadily prospered that it was chartered as Hope College in 1866. Youngest of the colleges of the Church is Central College, located at Pella, Iowa, which, after 63 years of work under the auspices of the Baptists, was transferred to the control of the Reformed Church in 1916. A board of education was established in 1828 with the design of aiding the most desirable young men in preparing for the ministry; and in 1865 the board was empowered by General Synod to aid the Classes of the Church in establishing academies and classical schools. Since 1844 the board of domestic missions has done efficient work in strengthening feeble churches and in supporting infant churches. With several other denominations the Reformed Church was associated in the foreign missionary work of the American Board from 1832 to 1857; since then it has had its own separate missionary work with special responsibility for fields in India, China, Japan and Arabia.

In government the Reformed Church in America is Presbyterian; in public worship the use of the Liturgy is optional, with the exception of the Offices for Baptism, the Lord's Supper and ordination of ministers, elders and deacons.

In 1792 the constitution of the American Church was formed, the 84 articles of the Synod of Dort being enlarged by adding 73 explanatory articles, more perfectly adapting the church law of the older Church to the requirements of modern Christian life in the «new world.» During the last 10 years also many constitutional changes, in form or in substance, have been proposed, discussed, modified and finally ratified. Four officers of the Church are recognized: ministers of the Word, professors of theology, elders and deacons. The judicatories of the Church are also four: the Consistory, the Classis, the Particular Synod and the General Synod. The Consistory of each church includes the minister with the elders and deacons in active service; the elders being charged with spiritual functions and the deacons with the care of the poor; the Consistory are usually the sole trustees of church property; the elders and deacons are elected by the church members for a term of two years; and rotation in office changes half the Consistory each year; the great Consistory is an advisory body of elders and deacons formerly in service. The Classis must have not less than three ministers and three elders, representing at least three churches; it meets twice a year, to license, ordain, install, dismiss, suspend or depose ministers, and legislate on the affairs of the churches, trying cases appealed from them. The Particular Synod has jurisdiction over its constituent Classes, forms new Classes or transfers congregations from one to another, and decides cases of appeal; it meets once a year and is composed of four ministers and four elders from each Classis. The General Synod, the court of final appeal, convenes early in June of each year; has jurisdiction over the entire Church; has a representation of at least two ministers and two elders from each Classis; and sends down to the Classes proposed and desirable changes in the constitution of the Church, to be finally decided for or against by their majority vote. In 1918 the Reformed Church in America had one General Synod, four Particular Synods, 38 Classes, 730 churches and 759 ministers, with 132,937 communicants. Consult Miller, 'Life and Writings of Wessel Gansfort' (1917); Kettlewell, 'Thomas A'Kempis and the Brethren of the Common Life' (1882); Hansen, 'Reformed Church in the Netherlands' (1884); Demarest, 'Reformed Church in America' (1889); 'Centennial Discourses on the Reformed Church' (1876); 'Centennial of the New Brunswick Theological Seminary' (1884); Corwin, 'Manual of the Reformed Church' (4th ed., 1902); Corwin, 'Digest of Constitutional and Synodal Legislation of the Reformed Church in America' (1906).

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**REFORMED CHURCH OF AMERICA, Board of Education of,** a body organized in 1828 by the General Synod to administer funds for the sustenance of needy students in the ministry. It was incorporated in 1869; since then it has managed the scholarship funds independently of the synod. Rutgers College is named for the first president of this board, Col. Henry Rutgers. See Reformed Episcopal Church.

**REFORMED CHURCH IN THE UNITED STATES (The),** formerly known as the German Reformed Church, was founded by immigrants from Germany and Switzerland who came to the New World during the 18th century, in several instances driven hither by persecution. Some went to Virginia, in which the first congregation was organized as early as 1714. Most of the immigrants settled in Pennsylvania. There the scattered bands were organized slowly into congregations through the efforts of John Philip Boehme, a schoolmaster, and of the Revs. George Michael Weiss and Michael Schlatter, aided by men and money sent by the *Reformed Church of the Netherlands* (q.v.). The assistance given them by the Dutch Church naturally led to their subjection to the Classis of Amsterdam, which from 1725 till 1792 exercised jurisdiction over the *Coetus*, as the ecclesiastical gathering in America was called which met from year to year, composed of the pastors of the congregations and one elder from each consistory or local session. In 1793 the German churches assumed independence by constituting themselves as a *Synod*, which at the time enrolled 22 pastors, 178 congregations and about 15,000 communicant members. The churches multiplied considerably during the next half century, by means of increased immigration, the effects of a revival, which lasted from 1829 till 1844, and by the use of modern methods in church work, such as the Sunday school and missionary efforts, although in some districts the growth was impeded by the vexing problem of the inevitable transition from the use of the German language to that of the English in church services, something which in some instances caused deplorable divisions. The lack of ordained ministers also interfered with the progress of the denomination, a couple of attempts to found theological seminaries ending in dismal failure. In 1844 the Church began to be disturbed by the so-called liturgical controversy, which did not end until 1878, when a peace committee was appointed to settle the difficulty. In 1863 the Eastern Synod and the Synod of Ohio united to form the *General Synod,* meeting every three years. At present there are nine synods, viz.: those of the Southwest, Interior, Central, German of the East, Potomac, Pittsburgh, Northwest, Ohio and Eastern. The membership of these various synods totals (1918) over 330,000 communicants, forming 1,785 churches, served by 1,300 ordained ministers. The theological seminary of Lancaster, Pa., is the oldest ministerial training school of the Church, dating from 1825. In Dayton, Ohio, the Central Theological Seminary is located. A third theological school is near Sheboygan, Wis., called the Mission House. Several colleges and academies are under auspices of the denomination, Franklin and Marshall College being the oldest. An extensive home mission work is carried on by two boards, under various nationalities, notably among the Hungarians and Germans. Foreign mission work is carried on in China and Japan, in each country with about 30 ordained pastors. The publication work of the denomination is very extensive, including several periodicals, of which the *Reformed Church Messenger* (Philadelphia) is the oldest. The doctrinal standard of the Church, the Heidelberg Catechism, is regularly taught to the youth of the Church. The rite of confirmation of the new communicant members is celebrated with solemnity. The Sabbath school is flourishing. The official book of praise, the «Hymnal,» was superseded in 1919 by a hymnbook published jointly by the Reformed Church, United States, and the Reformed (Dutch) Church in America. Prior to 1870 the 150 psalms were used in the song service. Since that date hymns only are employed. The government of the Church is presbyterial, according to the «Constitution,» which contains some 200 articles and is based on the Church Order of Dordrecht. Doctrinally the position of the denomination is broad and tolerant. Attempts to effect union with the Reformed Church in America and the Presbyterian Church (North) have hitherto borne no fruit.

Henry Beets.

**REFORMED CHURCHES IN SOUTH AFRICA.** The Union of South Africa contains six Reformed Churches. The oldest of these is the Dutch Reformed Church of the Cape province, dating from 1652 and numbering about 160 congregations, some of which are located in Rhodesia and Mashonaland. Its theological seminary is in Stellenbosch. Three missionary training schools and several philanthropic institutions are maintained by this Church, which in liturgy, doctrine and polity is in accord with the other reformed churches of Dutch origin. Both psalms and hymns are sung in public worship. The highest church court, the Synod, meets as a rule every three years. The Dutch Reformed Church in the *Orange Free State* became independent from the Cape Church in 1853. It numbers 61 congregations. In the *Transvaal province* the Dutch Reformed Church, dating from 1866, reports an enrolment of 71 churches, while the *Natal* denomination of the same name numbers seven congregations. Since 1906 the Dutch Reformed Churches of these four provinces have a common bond of union in their «Federal Council» which secures their co-operation in many ways. The weekly organ of these churches is *De Kerkbode,* Capetown. A vigorous mission work is carried on by the above-named denominations within their own territory as well as north and south of the Zambesi River. Some Boer missionaries labor in the Sudan. *De Koningsbode* is the missionary monthly. As a result of this missionary activity among the African natives over 100,000 persons belong to their «mission churches.» They form synods of their own. The *Reformed Church in South Africa,* a body composed of about 80 congregations, dates from 1858, when its founders seceded from the Dutch Reformed Church. It is found in the Cape province, Free State and Transvaal. Psalms are used in public worship, and not any hymns. The theological school of the denomination is located in Potchefstroom. Church organ, *Het Kerkblad.* This body is very conservative. Mission work is carried on among the natives, although on a small scale. Much stress is laid on the erection and maintenance of free Christian primary schools. The late President Kruger was one of the leading men of this denomination, usually known as the «Dopper Church.» The *Reformed* (*Hervormde*) *Church of Transvaal* is the smallest Dutch denomination in the Union of South Africa. Dating from 1853, it has been unable to pass beyond the boundary lines of the Transvaal, and in 1918 reported 32,500 souls. Its seminary is in Pretoria. The Reformed Church numbers 35,000 souls. The four Dutch Reformed churches total (1918) 525,000 souls—of whom about 150,000 are communicants. African Dutch is fast becoming the official language of all the denominations mentioned above, instead of the Holland language as hitherto.

HENRY BEETS.

**REFORMED EPISCOPAL CHURCH,** a denomination organized by members of the Protestant Episcopal Church, who give substantially the following statement of the events and circumstances which, as they believe, justify their course: (1) The Protestant Reformation in England had outwardly a political origin (in the act of the king, Henry VIII, renouncing allegiance to the Pope, and proclaiming himself head of the English Church); by which the work was biased and cut short. During the brief life of the young king, Edward VI, the regent, or protector, being in favor of the Reformation, great progress in it was made. Under Mary the supremacy of the Pope was again acknowledged. When Elizabeth became queen, wishing to harmonize her divided subjects, and hoping for reconciliation with Rome, she strove to have the Liturgy framed so as to satisfy both parties. Consequently it contained contradictory elements. At a later period, when she had found her hope futile, the articles of faith adopted were decidedly Protestant. Thus it came to pass that in the Church of England two parties found support in her Ritual; the one Protestant, the other having an affinity with Rome. (2) After the American Revolution, when the Church of England in the colonies became the Protestant Episcopal Church of the United States, the Book of Common Prayer, having been adopted without material alterations, retained its conflicting elements. (3) The Tractarian movement, which began at Oxford, 1833, was a successful endeavor to revive the principles of antiquity and Catholicity contained in the Prayer Book, in opposition to its Protestant elements. It discarded Protestant principles and taught the doctrines of apostolic succession, priestly absolution, baptismal regeneration, the real presence and the authority of the Church. (4) These teachings produced a powerful effect in the United States also. A great increase in ritualism, and of the drift toward Rome, was soon manifested; the opposition between the «High» and the «Low Church» parties was intensified, and practical measures were adopted by each which widened the chasm. (5) Several subsequent public events fanned the flame of discontent, especially the censure of one clergyman for preaching in a Methodist church, and the suspension of another for omitting the word «regenerate» in the baptismal office. (6) Remonstrances and petitions for relief, which were numerously and urgently presented to the General Convention, produced no effect. (7) During the sessions of the Evangelical Alliance in New York in October 1873, Bishop Cummins of the diocese of Kentucky, having, by invitation, officiated at a union celebration of the Lord's Supper, in company with representatives of other denominations, was for this act of Christian fellowship bitterly censured through the press by members of the High Church party. After this, convinced that he could no longer rightfully continue in a Church whose theory and practice (as interpreted by the majority of its members) denied the brotherhood of believers in Christ, Bishop Cummins withdrew from the ministry of the Protestant Episcopal Church. (8) This led to the organization in 1873 of the Reformed Episcopal Church, of which Bishop Cummins and the Rev. Dr. Charles E. Cheney were elected bishops. At the same time the following declaration of principles was adopted: I. The Reformed Episcopal Church «holding the faith once delivered to the saints» declares its belief in the Holy Scriptures of the Old and New Testaments as the Word of God, and the sole rule of faith and practice; in the creed «commonly called the Apostles' Creed»; in the divine institution of the sacraments of baptism and the Lord's Supper; and in the doctrines of grace substantially as they are set forth in the Thirty-nine Articles of Religion. II. This Church, recognizes and adheres to Episcopacy, not as of divine right, but as a very ancient and desirable form of Church polity. III. This Church, retaining a liturgy which shall not be imperative or repressive of freedom in prayer, accepts the Book of Common Prayer, as it was revised, proposed and recommended for use by the General Convention of the Protestant Church, 1785; re-serving full liberty to alter, abridge, enlarge and amend the same as may seem most conducive to the edification of the people, "provided that the substance of the faith be kept entire." IV. This Church condemns and rejects the following erroneous and strange doctrines as contrary to God's word: (1) That the Church of Christ exists only in one order or form of ecclesiastical polity. (2) That Christian ministers are "priests" in another sense than that in which all believers are "a royal priesthood." (3) That the Lord's table is an altar on which the oblation of the body and blood of Christ is offered anew to the Father. (4) That the presence of Christ in the Lord's Supper is a presence in the elements of bread and wine. (5) That regeneration is inseparably connected with baptism. To this statement it may be added that in this Church the bishops do not constitute a separate order, but are presbyters; in council they vote with and as their brother presbyters, and are subject to confirmation or appointment by the general council. Statistics, 1910: Churches, 80; ministers, 94; members, 9,610. The present bishops are Samuel Fallows of Chicago, Robert L. Rudolph of New York, William Brewing of Toronto and Arthur L. Pengelley of Charleston, S. C.

**REFORMED PRESBYTERIAN CHURCH.** See CAMERONIANS; PRESBYTERIAN CHURCH IN THE UNITED STATES.

**REFORMED SCHOOL OF MEDICINE.** See MEDICINE, ECLECTIC.

**REFRACTION,** a deviation in the course of a ray of light when it passes through the surface of a transparent medium. A familiar result of refraction is seen when one looks very obliquely into a transparent pool of water, of which the bottom is visible. The water seems much shallower in such a case than it really is. Another example is the bent appearance of the oars of a boat when the blades are seen obliquely under water. When ordinary light is refracted, it is also decomposed into light of the various elementary colors. This decomposition is due to the unequal refraction of light of different wave-lengths; and the resulting separation is known as *dispersion.* It is too small to be noticed in ordinary cases, such as those we have already cited. But, on looking at a source of light through a glass prism, it is very evident. See LIGHT; SPECTRUM.

The general theory of refraction is quite simple, and may be expressed in the following way: The power of a transparent medium to refract a ray of light is expressed by a certain number called its *index of refraction.* The phenomenon of dispersion shows that this number is different for rays of different colors, or wave-lengths. It is generally greater the denser the medium; but to this rule there are many exceptions. The mathematical principle by which the amount of refraction is determined is as follows: Let AB represent the surface of a transparent medium, LM. Let a ray of light, PQ, strike this surface obliquely at Q and enter the medium, and let QR be its course through the medium. Draw through Q the perpendicular DE. Then the angle PQD which the ray makes with the perpendicular before it enters the medium is called the *angle of incidence;* and the angle EQR which it makes after entering the medium is called the *angle of refraction.*

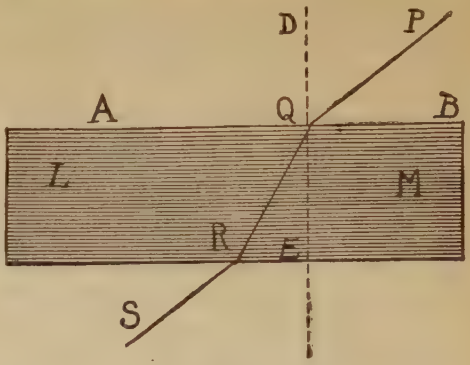

FIG. 1.

The law of refraction then is:

For one and the same medium, and the same ray of light, the ratio of the sine of the angle of incidence to that of the angle of refraction is a constant quantity for the same medium and the same ray.

This constant ratio is called the *index of refraction.* The law may be expressed in algebraic language as follows: Put

I, the angle of incidence;
R, the angle of refraction;
$n$, the index of refraction.

Then we shall have

$$n = \frac{\sin I}{\sin R}$$

or,

$$\sin R = \frac{\sin I}{n}$$

It is a law of the course of light that, if a ray passes in the opposite direction, say from R to Q, it will continue on the line QP after leaving the medium. It follows if the ray PQ emerges from the medium at R it will suffer refraction according to the same law as a ray entering it, but in the reverse direction. Hence if the lower surface of the medium is parallel to the upper surface, the emerging ray RS will be parallel to PQ.

One result of the above law is that a ray entering or leaving a medium in a direction perpendicular to the surface of the latter will undergo no refraction, but will continue in the same straight line. In this case the angles of incidence and refraction are both zero.

From the above equation we find that, if the angle R and the index of refraction are given, we can find the angle of emergence by the equation

$$\sin I = n \sin R.$$

Now, the angle R may be so large that this expression is greater than 1. Then there will be no possible value of the angle of emergence to fulfil the condition. It is found that, in this case, the ray will not emerge from the medium at all, but will be reflected from its inner surface as if the latter were polished and opaque. This is called *total reflection,* and is frequently applied in optical instruments. An example will show how this result may be brought about. Let ABC, Fig. 2, be the section of a glass prism, the angle at C being a right angle. Let a ray enter the prism at the point Q in a direction perpendicular to the surface BC. It will then pass on and will reach the lower surface of the prism at the point R.

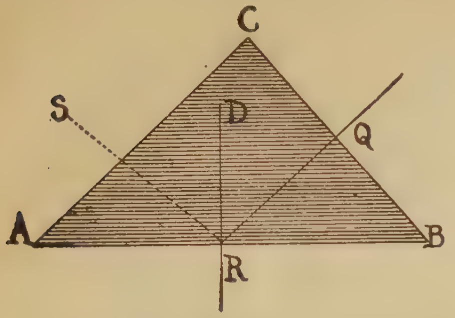

Fig. 2.

the angle DRQ will then be 45°. The sine of this angle is 0.707+

Now, a glance at the table which follows will show that in all sorts of glass the index of refraction is greater than 1.5. It follows that the sine of the angle at which the ray QR should emerge from the prism would be greater than 1.5 × 0.7, and therefore greater than 1. There is then no possible angle to fulfil the conditions. The light is therefore reflected in the direction RS, as though the surface AB were perfectly opaque and highly polished.

**Indices of Refraction of Various Substances.**— Any one definite chemical compound has, at a given temperature, always the same index of refraction for the same ray. But glass is not such a compound, because its ingredients differ in different specimens of glass. It is impossible to make two pots of glass so exactly alike that they shall have the same index of refraction. It is owing to this fact that the idea frequently entertained, of making a telescope by putting together different pieces of glass, is impracticable. The following table shows the indices for a number of common transparent substances, and for three of the principal rays, C, D, F. It will be seen that glass has a greater refracting power than water; and that plate glass is more refracting than crown. The diamond is the substance which has the greatest refracting power of all. It has also a great dispersive power; and it is owing to this fact that a diamond with polished faces shows so many brilliant colors when a ray of light falls upon it.

TABLE OF INDICES OF REFRACTION.

| | Ray C | Ray D (mean) | Ray F |
|---|---|---|---|
| Soft crown glass........ | 1.511910 | 1.514580 | 1.520994 |
| Medium crown glass.... | 1.513558 | 1,516149 | 1.522343 |
| Hard crown glass....... | 1.514571 | 1.517116 | 1.520994 |
| Light flint glass........ | 1.537682 | 1.541022 | 1.549125 |
| Medium flint glass..... | 1.575903 | 1.579880 | 1.589870 |
| Dense flint glass....... | 1.645773 | 1.651242 | 1.664981 |
| Rock salt.............. | 1.54050 | 1.54418 | 1.55324 |
| Iceland spar (ordinary ray)................ | 1.65435 | 1.65833 | 1.66780 |
| Rock crystal (ordinary ray)................ | 1.5419 | 1.54424 | 1.54970 |
| Fluor-spar............ | ........ | 1.4339 | ........ |
| Canada balsam........ | 1.528 | 1.53 | ........ |
| Diamond.............. | 2.417 | ........ | ........ |
| Ice.................... | 1.306 | ........ | ........ |
| Water................ | 1.3307 | 1.3324 | 1.3366 |
| Carbon disulphide..... | 1.6240 | 1.6333 | 1.6584 |
| Air.................... | 1.000290 | 1.000292 | 1.000294 |

The refractive power of a substance is different at different temperatures. As a general rule, glass refracts more the colder it is. Consequently the focal length of a telescope will generally be slightly shorter the colder the weather. The difference is, however, slight and there are exceptions to the rule.

**Refraction by the Atmosphere.**— It will be seen by the preceding table that air has an appreciable, though slight, refracting power. It follows that a ray of light coming from a star is gradually bent toward the perpendicular as it approaches the surface of the earth. Only when a star is in the zenith does the ray suffer no refraction. The result is that astronomical observations upon the declination or altitude of a heavenly body require to be corrected for refraction. The latter, depending upon the density of the air, is greater the colder the air and the higher the barometer. Hence the astronomer has always to record the readings of his thermometer and barometer when he observes the altitude of a heavenly body. A rough approximation to the amount of the refraction can be made by the rule that at small zenith distances it is nearly 1″ for each degree of zenith distance; and that, if the altitude is not greater than 45°, it increases nearly as the tangent of the zenith distance. The rate of increase is somewhat less than that given by this law, but still the refraction increases rapidly as we approach the horizon, where it usually amounts to about 35′. This is greater than the diameter of the sun or moon. It follows that, when we see the lower limb of the sun just touching the horizon at sea, the luminary is actually entirely below the horizon. Moreover, the lower limb is elevated more by refraction than the upper one, with the result that a certain ellipticity is produced in the apparent outline of the sun, which is plainly perceptible to the naked eye.

A ray of light always suffers refraction when passing through the air in any other than a vertical direction, and its course is most curved when it is horizontal. In this case the curvature under ordinary conditions of the air is about one-sixth that of the earth. But this result depends entirely at the rate of increase or diminution of the temperature as we rise above the ground. If the air is very cold near the ground, and rises rapidly in temperature above it, a horizontal ray may be more curved than the earth, and strike the latter at some point. Objects may then be seen at such a distance that they are far below the horizon, as was once noticed by an Arctic navigator who, when separated from one of his ships, saw her image upside down above the horizon and, sailing toward it, found the ship. In the contrary case, when the air near the ground is much warmer than at a small height above it, the reverse effect is produced. A horizontal ray is then refracted upward so as not to strike the earth at all. It is through this action that the mirages, so frequent in the desert and elsewhere, are produced. See MIRAGE.

SIMON NEWCOMB.

**REFRIGERATION AND REFRIGERATING MACHINERY.** Refrigeration is the operation of cooling substances by artificial means. Natural ice forms the greatest source of refrigeration, but there are certain conditions where cold produced through mechanical means possesses advantages over natural ice, which have led to the development of a number of refrigerating machines. The advantages of mechanical refrigeration over that produced by natural ice are that the temperatures of the objects cooled can be more readily regulated, lower temperatures can be obtained and in many cases the desired cooling effect can be secured at a lower cost. The industrial importance of mechanical refrigeration is of ever-increasing importance in modern life. One of its earliest and largest applications is to brewing. Moreover, it has revolutionized the industry which relates to the distribution and sale of ice. It has given us a product which is not only better than natural ice but can be sold at a price with which natural ice in many instances cannot compete. It has further created an enormous new industry in the transport and storage of the perishable necessaries of life in a cold state. Broadly speaking, the methods that are employed for the production of cold may be classified under two heads, the second of which is by far the more important in practice. There is, first, the production of cold directly by the agency of heat, and, second, the production of cold by the expenditure of mechanical work. It is by the expenditure of mechanical work that nearly all modern refrigeration is carried out, namely, by compressing a gas or a vapor and afterward allowing it to expand under conditions which allow it to absorb heat from the thing that is to be cooled. To maintain the low temperature of a cold storage room or refrigerator space one must have a continual extraction of heat going on from a thing which is already colder than its surroundings. The same is true in the case of a brine tank for the production of ice. The brine has to be maintained at a temperature somewhat lower than that at which water freezes, considerably lower if the process of freezing is to go on at a reasonably fast rate. The heat which comes into the brine from the water to be frozen, the heat which the water gives out when it freezes and the heat which leaks in from all sources has to be continuously extracted from the brine at this comparatively low level of temperature. The heat so extracted is not destroyed but is raised to a higher level of temperature and is discharged by being given up to some substance which acts as a receiver of heat. In all actual cases of refrigeration the substance which absorbs the rejected heat is circulating water, which becomes more or less warmed by the heat which it takes up. The refrigerating machine accordingly works between two temperatures; the lower temperature is that at which heat is taken in from the body which is to be kept cold, and the higher temperature is that at which heat is rejected to the circulating water or other substance which absorbs it. In order that this process may go on an expenditure of mechanical power is necessary.

**Classification of Refrigerating Machines.** — Refrigerating machines are generally classified by reference to the particular working substance they employ. A broad distinction may be drawn between machines which use air as their working substance, and those which use a liquid which is alternately vaporized and liquified during the cycle of operations. Generally speaking, in this second class of machines the liquid which is used is one whose vapor pressure is higher than the pressure of the atmosphere, under the actual conditions of temperature at which the machine works. If we take, for instance, ammonia or carbonic acid as the liquid which is alternately liquefied and vaporized, we find that under the conditions of temperature usually obtaining, the pressure of the vapor is higher than the atmospheric pressure. It is, however, quite possible to use a liquid which can only be vaporized by submitting it to a lower pressure than that of the atmosphere. Water is an instance in point. When water is the working substance, the whole action is taking place in what is, relatively speaking, a vacuum. It has to take place in chambers which are maintained at a pressure much below the pressure of the atmosphere, and consequently machines using water as their working substance are frequently spoken of, for this reason, as «vacuum» machines. Further, when a vaporized liquid is used for working substance one may either adopt simply mechanical compression as the means of restoring the vapor to the liquid state, or one may adopt a chemical action between the vapor and some other substance which has an affinity for it. This alternative gives rise to the grouping of machines under the title of «compression» machines on the one hand or «absorption» machines on the other. The latter are those in which a quasi-chemical action or species of solution goes on as a substitute for the mechanical compression used in other vapor machines. In absorption machines there is usually a direct application of heat instead of mechanical power. Machines of the vapor-compression type are further classified according to the particular vapor which they employ, as ammonia, carbonic acid, sulphurous acid or ether machines. Air machines are divided into two groups, in one of which the same volume of air is made to pass again and again through a cycle of operations without leaving the machine. Such machines are called closed cycle machines to distinguish them from those air machines in which air is discharged from and taken back again in the cycle at atmospheric pressure.

**Air Machines.**— Refrigeration machines which employ air as the working substance filled an important place in the development of mechanical refrigeration, and are still doing useful work; though the more efficient and more compact machines of the vapor-compression-type, using ammonia or carbonic acid, have now to a great extent driven them from the field. Dr. Gorrie of New Orleans invented an air machine in 1845. It had a compression cylinder in which the air was compressed, and from which it passed into a chamber which was kept cool by surrounding water. This chamber was maintained at a pressure of about 15 pounds per square inch above the pressure of the atmosphere. The air was partly cooled during compression by the injection of water, so that what passed into the receiver was really air and water together. The air was further cooled in the chamber by the application of cold water outside, and then it passed on to another cylinder in which it was allowed to expand down to something like atmospheric pressure. While it was expanding it was mixed with a quantity of brine injected into the expansion cylinder. By expansion the air became much cooled and its low temperature was communicated by direct contact to the brine in the expansion cylinder. The air leaving the expansion cylinder was allowed to escape to the atmosphere, while the brine cooled to about 20° F. was conveyed into a tank and was usefully applied to ice-making or other refrigerating purposes. Many improvements were made in Gorrie's machine, which was followed in 1862 by Kirk's machine, an air machine of the closed cycle type. These types of machine and their successors are substantially the same. Their essential parts are a compression cylinder and an expansion cylinder. The first takes air from the room which is to be kept at a low temperature, compresses it; the air is then cooled by circulating water while compressed and is then returned to the cooled room by the expansion cylinder. Air machines have played a large part in developing the commercial applications of cold, although now the first place is taken by other types. Air can be employed as a medium for cooling itself more efficiently than it can be employed as a medium for cooling anything else. Also, air machines use a working substance that is simple and harmless and that costs nothing. For use on shipboard the air machine still retains the favor of some engineers although the more efficient vapor-compression machines dispute its sway even there.

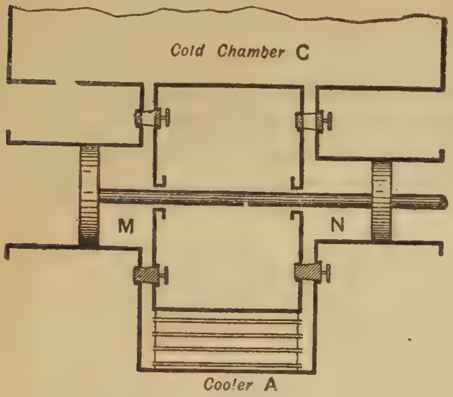

FIG. 1.— Diagram of Open-cycle Air Machine.

C represents space which is to be kept cooled. Air is taken from it by compression cylinder M. It is then compressed from 1 to 4 atmospheres or so, and is discharged into the vessel A, where it is cooled by a circulation of cold water. The air is heated in compression, but the circulating water brings it down to a temperature only a little above that of the water itself. The air is next passed into an expansion cylinder N. During expansion it cools rapidly and reaches the cold room C at a very low temperature.

**Absorption Machines.**— In machines of this type cold is produced as a direct result of the utilization of high-temperature heat, without the intermediate step of converting the heat into mechanical work. In any machine of this type there are two substances used which have an affinity for one another so that one tends strongly to unite with or dissolve in the other when they are in the cold state, but they can be separated by applying heat. In the action of the machine they are alternately allowed to unite and made to separate. By the direct application of heat one of them is driven off in the form of a vapor. It is then condensed, is allowed to re-evaporate, and is absorbed by the other substance as soon as it does so. While re-evaporating it takes up heat from bodies round it, thus becoming effective for refrigeration. Of practical machines of the absorption type there are two kinds. In one kind the vapor used is water, and it is absorbed by sulphuric acid. In the other kind the vapor is ammonia, and it is absorbed by water. When water vapor is used, the pressure at which the vapor is formed must be very low, and hence machines using water and sulphuric acid are often described as vacuum machines. The method was known from about 1810 when Leslie described the process. In 1878 Windhausen made an improved machine of this type for the making of ice.

Ammonia absorption machines employ ammonia dissolved in water and are in much wider use than the sulphuric acid or vacuum machine. The action is in general respects the same, but as ammonia has a much higher vapor pressure than water, there is no vacuum, but pressure higher than the atmosphere throughout

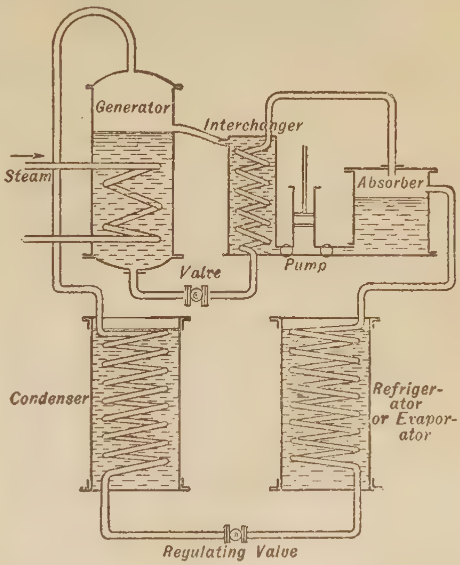

FIG. 2.— Diagram of Cycle of Ammonia Absorption Machine.

The generator (top left) contains a solution of ammonia; heat is applied to it by a steam-coil. Ammonia gas passes over to the condenser, which is a coil kept cold by water circulation. Here the ammonia gas is condensed and is next passed through a valve into the evaporator or refrigerator. In evaporating there the ammonia absorbs heat from surrounding bodies, thus performing the work of a refrigerant. It is evaporated at low pressure and temperature. After re-evaporation the ammonia gas passes to the absorber where it is absorbed by water. This liquid is then pumped back to the generator where it goes in at the top, thus completing a cycle of operations.

the cycle. The ammonia absorption machine consisted merely of two vessels, in one of which was placed a strong solution of ammonia in water; the other in the first instance was empty, and was surrounded by cold water. The vessel containing the solution of ammonia was heated and the gas passed over under pressure into the other vessel, where it was condensed, giving up its latent heat to the water outside. Liquid anhydrous ammonia collected in the cold vessel while the solution in the first vessel became more and more dilute. After some time the source of heat was removed, and the vessel containing dilute solution was surrounded by cold water. The condensed ammonia in the other vessel then evaporated and was reabsorbed by the dilute solution. In re-evaporating, the ammonia exerted a refrigerating effect. This machine was intermittent in action but a continuous machine was soon developed from it by Reece, Stanley, Mart and others adding features which are found in the ammonia absorption machine of the present day. As has already been explained, the essential difference in an absorption machine and a compression machine consists in the method of increasing the pressure of the ammonia gas leaving the refrigerating coils. For the compressing pump and the steam-engine in the compression system there is substituted a vessel called an absorber, and a pump for pumping the liquid into a steam still. The condenser, liquid ammonia reservoir, expansion cock and cooler are the same in the two systems. A section of an absorption refrigerating machine is shown in Fig. 3. A is the still or generator in which the aqueous ammonia is heated in order to drive off the gas. The ammonia gas passes off through the pipe *aa* to the rectifier *B*, where the gas is cooled to a point where any water vapor in it will be condensed. The ammonia gas free from water vapor passes to the condenser *C*, where it is condensed and passes through the pipe *bb* to the ammonia reservoir *D*. From the reservoir *D* the liquid ammonia passes through the valve, or expansion-cock *E*, into a refrigerating chamber or cooler F, where it is evaporated through heat supplied by the coils contained therein through which a calcium chloride brine is circulated. The cold brine is circulated through the pipes *dd* to and from coils in the cold storage rooms. The ammonia gas leaves the cooler through the pipe *cc* and enters near the top of the absorber *J*, where it meets a spray of weak ammonia liquor, which is conducted to it through the pipe *ee*. The ammonia gas is taken up by the weak ammonia liquor in the absorber and forms the strong liquor which leaves the absorber through the pipe *ff* and is forced by the pump *K* through the pipe *ll*, the exchanger *L* and the pipe *mm* into the top of the generator, thus completing the cycle. Heat is given off by the ammonia on absorption, which is taken up by water circulated through coils contained in the absorber. The exchanger *L* saves heat which would otherwise be lost, and thus increases the efficiency of the machine. The weak liquor on leaving the generator is at the highest temperature at which the aqueous ammonia is brought in the system, whereas the strong liquor leaving the absorber is at the lowest temperature. It is necessary to cool the weak liquor before it enters the absorber and to heat the strong liquor to the temperature of the generator, and this is accomplished, in part, by the exchanger by making the weak liquor heat the strong liquor and the strong liquor cool the weak liquor. The weak liquor at about 270° F. is taken off near the bottom of the generator and passes through the pipe *nn* to the top of the exchanger *L* and thence through a coil contained therein. From the bottom of the exchanger it passes through the pipe *ee* to the absorber *J*. The strong liquor at about 130° F. passes through the exchanger *L* in the reverse direction to that of the weak liquor, and the interchanging of heat is such that the weak liquor leaves the exchanger say 100° F. cooler than it entered and the strong liquor is heated a corresponding amount. The strong liquor is made to enter the top of the generator and pass through what is called an analyzer *M*. The

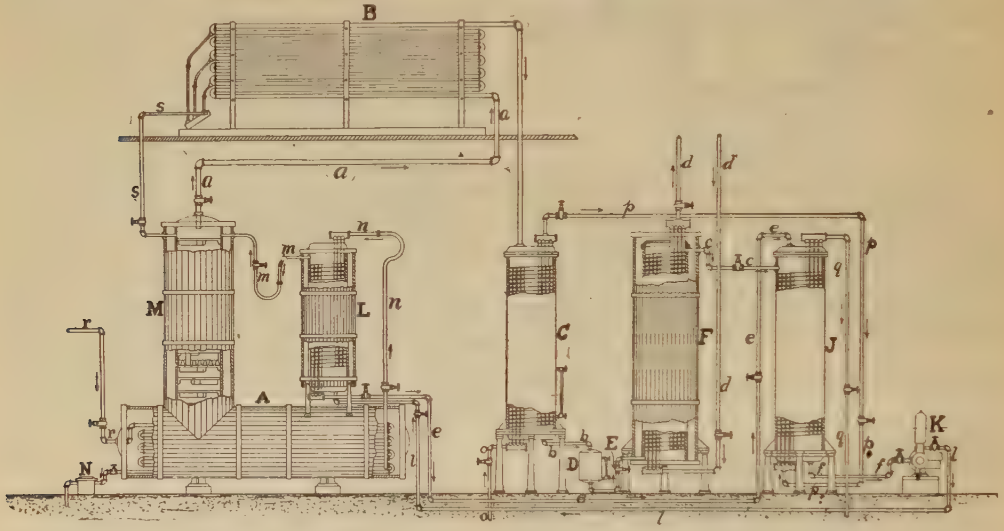

FIG. 3.

analyzer adds to the efficiency of the generator by causing the strong liquor to meet the outgoing gas generated at the bottom of the still. An exchange of heat takes place, which causes much of the ammonia contained in the strong liquor to be driven off at a lower temperature than that which exists at the lower part of the still and produces ammonia gas more free from water vapor than could be secured if the strong liquor were introduced into the lower part of the still. The cooling water passes first through the condenser *C*. entering through the pipe *oo* and from thence to the absorber *J* through the pipe *pp*. It finally leaves the absorber through the pipe *qq*. Heat is supplied to the generator by means of steam which enters a coil contained therein through the pipe *rr*. The water vapor condensed in the rectifier together with the ammonia which it carries with it is returned to the analyzer by means of the pipe *ss*. The drip water from the generator coil is discharged through the steam trap *N*.

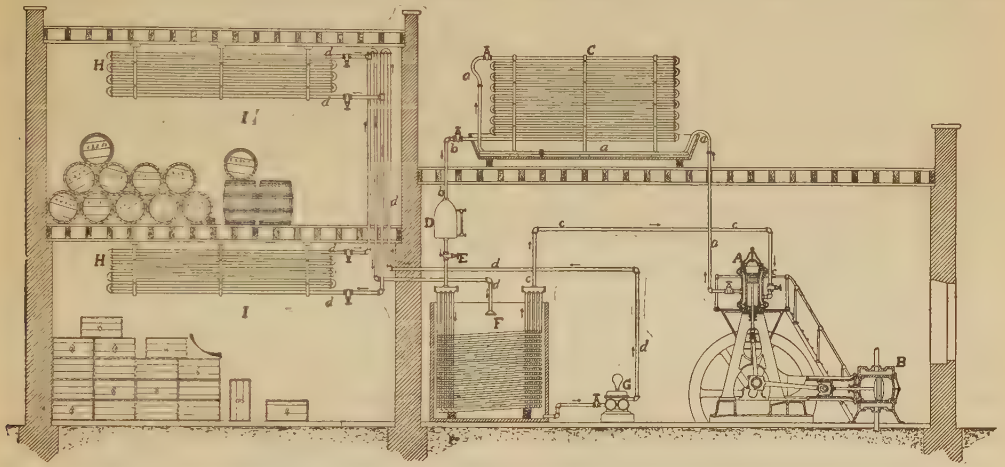

FIG. 4.

**Comparison of Ammonia Compression and Absorption Systems.**— Tests have shown that the economy of a compression system when driven by an engine requiring three pounds of coal per hour per indicated horse power is about equal to that of the best absorption system when used in connection with a boiler of good efficiency provided the suction pressure of the ammonia gas is about 20 pounds per square inch above the atmosphere — that is when the temperature of the substance to be refrigerated is about 20° F. For higher temperatures and higher suction pressures the compression machine is more economical in fuel, and for lower temperatures the absorption machine is more economical, unless the compression system employs a multiple expansion engine so as to reduce the coal consumption below the three pounds on which this comparison is based.

**Ammonia Compression Machines with Brine Circulation.**— Fig. 4 shows a compression system for a cold storage warehouse. *A* is the compressing cylinder which is driven by the steam engine *B*. The gas on being compressed in *A* passes up through the pipe *aa* to the condenser *C*, where it is liquefied. The liquid anhydrous ammonia passes from the condenser through the pipe *bb* to the liquid ammonia reservoir *D*. From the reservoir *D* the liquid ammonia passes through the valve *E*, termed «the expansion cock,» where it is reduced in pressure from say 140 pounds per square inch above the atmosphere to a pressure of say 15 pounds per square inch above the atmosphere, and thereby is reduced in temperature from about 80° F. to about 0° F. The anhydrous ammonia at a temperature of about 0° F. flows in coils of pipe in the brine cooling tank *F*, and abstracts heat from the brine by being evaported. The gas produced by the evaporation of the ammonia passes from the condenser coils through the pipe *cc* to the compressing cylinder *A*, where it is again compressed and returned to the condenser. The brine which is reduced in temperature in the cooler *F* is pumped by means of the pump *G* through the pipes *dd*, which are connected with coils *HH* in the cooling rooms *II*. After the brine has passed through the cooling coils it is returned to the cooler *F*. In passing through the expansion cock *E* about 10 per cent of the weight of the anhydrous ammonia will be vaporized and it is the heat required to produce this vaporization that causes the liquid to be reduced in temperature from say 80° F. before throttling to 0° F. after throttling. Ninety per cent of the ammonia is, therefore, in the liquid state when it has attained the temperature of ebullition corresponding to the pressure existing in the cooler. The brine in the cooler is at a slightly higher temperature than the liquid ammonia contained in the coils and transmits heat to it so as to boil it and convert it into gas. The brine in parting with its heat is thus cooled to the extent of the heat required to evaporate 90 per cent of the liquid ammonia which passes through the throttling cock. In some types of compression machines all of the ammonia is not allowed to vaporize in the cooler, whereas in other systems care is taken to secure a complete evaporation. This gives rise to two classes of machines, one of which is known as the wet or cold compression and the other as the dry compression system. The brine returns to the cooling tank after passing through the storage rooms at about 6° higher temperature than that at which it leaves the cooler and the mean temperature of the brine is about 10° higher than the boiling point of the ammonia corresponding to the suction-pressure. The mean temperature of the brine is 6° less than that of the air in the storage-rooms. For the storage of beer a temperature of about 36° F. is required, and this is secured with a pressure of about 28 pounds per square inch above the atmosphere in the coils of the cooler. Slaughter-houses require about 25° F. in their storage-rooms, which must be obtained by a pressure of about 22 pounds per square inch in the cooler. The storage of fish requires a temperature of about 0° F., for which a pressure in the brine coils of the cooler of about five pounds per square inch above the atmosphere must be used. Instead of a brine made with ordinary salt one formed from chloride of calcium is often used as a circulating medium because it produces less corrosion in the pipes than salt brine and may be brought to a lower temperature before it freezes or becomes partly congealed. In another system air is blown around the coils of the cooler and is circulated through the storage-rooms, and a chamber freshly filled with material can be more quickly cooled than by the use of cooling coils. The air system appears to be more expensive to operate than the brine system.

**Direct Expansion Systems.**— In some machines instead of expanding the ammonia in coils placed in the cooler and forcing cold brine through the coils in the refrigerating-rooms the anhydrous ammonia is expanded directly in coils placed in the refrigerating-rooms. In this system we eliminate the loss due to the difference in temperature between the brine and the coils in the cooler. The use of brine is, however, regarded by many as a safeguard against damage to the material in the storeroom by the accidental escape of ammonia from the circulating pipes; the brine circulation is for this reason much used, notwithstanding the fact that the cost of the piping is less for the direct expansion system and that there is a saving in the cost of operation. This saving is due to dispensing with the brine circulating pump and permitting from five to 10 pounds higher pressure to be used in the coils of the cooler. In the wet system of compression, known also as the Linde system, the presence of liquid ammonia in the compression cylinder limits the highest temperature attained by the ammonia during compression to the boiling point of the ammonia liquid corresponding to the highest pressure, or say to 80° F. With the dry system of compression the maximum temperature in the compression cylinder is about 100° F. higher than this, and if the cylinders were non-conductors of heat the wet process would be more economical than the dry. It appears by tests, however, that the influence of the conductivity of the cylinder walls in abstracting heat in one part of the cycle and giving it back in part in another, makes the two systems about equal in economy.

**Other Compression Systems.**— Water, sulphuric ether, sulphur dioxide, carbonic acid, methylic ether and certain petroleum products may be used in compression systems in the same way as ammonia. In the case of water temperatures colder than 32° F. require a suction pressure of within .08 pound per square inch or 0.16 of mercury of a perfect vacuum. The dimensions of a compressor cylinder of such a plant is about 150 times that for ammonia. The use of water as a working fluid is, therefore, impracticable except for the production of ice as described under section *Ice-making*. Sulphuric ether was the first substance practically applied to refrigeration by the compression system. The volume of the compressing cylinder is, however, about 17 times that required for ammonia, and its use has, therefore, been abandoned. Sulphur dioxide machines produce a temperature of about 5° F. in the cooler with a suction of about three pounds below, and a condenser-pressure about 35 pounds per square inch above the atmosphere. Their economy is about the same as with ammonia, but the compressing cylinder must be about three times as large as for ammonia. The Pictet system uses sulphur dioxide, and in some cases what is called the Pictet fluid, which is sulphur dioxide mingled with about 3 per cent of carbonic acid. Carbonic acid gives a temperature of 5° F. in the cooler with a suction-pressure of about 330 pounds per square inch above the atmosphere and a condenser pressure of about 900 pounds per square inch. The fuel required is more than with ammonia, but the size of the compressor cylinder is about one-fourth that required for ammonia. Carbonic acid is used only to a limited extent; but the compactness of the machine employing it, together with the fact that any bursting of a pipe or leakage will not lead to the same disastrous results as with ammonia, renders it more suitable for service on ships and also in some other special lines of work. Nothing definite is known of the economy of the few machines which have used methylic ether and petroleum products. From the physical properties of these substances it would appear that they would give about the same economy as ammonia or sulphur dioxide.

**Ice-Making.**— The production of artificial ice. The heat is usually abstracted from the water to be frozen by evaporating a volatile liquid, such as ammonia, sulphur dioxide or ether, which in evaporation absorbs heat. Anhydrous ammonia is most commonly employed. This boils at 27° F. below zero at atmospheric pressure. If the anhydrous liquid ammonia is introduced in a coil of pipe which is placed in a tank of brine it will absorb heat from the brine during the process of boiling equal to the latent heat of evaporation. If a can of water is immersed in the brine it will in turn be cooled and then frozen, and this process constitutes the elements of the Can System of ice-making. If on the other hand, the ammonia in the coil is made to cool a flat plate forming the vertical side of a water reservoir ice will be formed directly on the plate, and this constitutes the elements of the Plate System of ice-making. The vapor produced when the liquid ammonia evaporates in the coil is, in all cases, again converted to the liquid state so that it may be used over again. In abstracting heat from the refrigerating coil the vapor is at a low pressure, say 15 pounds per square inch above the atmosphere at which the boiling point of the liquid is 0° F. To convert it to a liquid it must be raised in pressure, to say 140 pounds per square inch above the atmosphere, at which the boiling point of the liquid is 80° F. As the temperature at the boiling point of a vapor is the same as that at the condensing point, the vapor at 140 pounds pressure can be condensed by cooling it to 80° F., and after such condensation it may be returned to the refrigerating coils and used over again for abstracting heat from the brine. To raise the pressure of the gas from 15 pounds to 140 pounds per square inch we may employ either of two methods — compress it by means of an engine, or we may absorb the vapor in cold water and then heat the aqueous solution of ammonia in a still, and so drive the gas off at high pressure. These two methods of compression constitute the distinguishing features of what is called the compression and absorption systems of ammonia refrigerating machines.

In the can system of ice-making, distilled water which has been freed of air is ordinarily used for freezing and this produces a cake of transparent and clear ice with the exception of a thin feather of air bubbles in the centre of the cake and a portion of the top of the cake which is white where the water expands over that first frozen. The distilled water from which ice is made is obtained by condensing the exhaust steam from the engine of the refrigerating machine and by condensing live steam. In an economical plant the steam required to run the engine and for other purposes is less than the amount of ice produced, and to make up the difference some live steam is admitted directly to the condenser in order to supply the necessary amount of distilled water. In an ice-making plant where the water is distilled by evaporating it in an ordinary boiler, the weight of ice made per pound of coal is, therefore, limited by the evaporation of the boiler and the amount of ice produced is less than the total amount of steam generated by what is lost through the drips from the steam pipes and other causes. It is possible, therefore, to make more ice per pound of coal by the plate system of ice-making where the water is not distilled than it is by a can system as ordinarily operated. In an economical compression plant where the ice is made by the can system a single cylinder engine working without a vacuum will require less steam to run it than the weight of ice which is produced, and if distilled water is used for freezing it will not increase the efficiency to employ a more economical engine. In a plate system, however, a compound engine may be used with a corresponding gain in the efficiency.

In order to make it possible in a can system to make a greater amount of distilled water ice than the weight of water evaporated by the boiler it has been proposed to use multiple-effect evaporators for distilling the water. This was done in a plant at Newark, N. J., but the system had to be abandoned on account of the evaporator becoming coated with a hard scale which was deposited from the water to such an extent that the evaporator soon fell off in its capacity and efficiency. Where the steam from the engine operating the refrigerating machine is condensed in order to obtain distilled water for making the ice, the oil which this water contains must be eliminated. This is accomplished by reboiling the water which comes from the condenser in an open tank by means of a jet of live steam; then cooling and running it through an oil separator and finally through charcoal filters. Reboiling the distilled water removes the air which it may contain. It is possible to so thoroughly remove the oil that there will be no traces of it in the ice, whereas, if this is done imperfectly, the centre of the cake, when freshly broken open, will have a slight smell resembling that of tar. The presence of a trace of oil can be detected by the odor when it cannot be detected by taste. In the plate system the ice is formed on the flat cooling surface to the depth of about six inches in two days, nine inches in four days and 12 inches in seven days. The plates are usually allowed to build up to about 12 inches thick before harvesting. They are then melted free from the cooling plate by passing hot ammonia gas under pressure into the cooling coil which by condensation supplies the necessary heat. After this the blocks of ice are cut to the size required by sawing or by a parting tool heated by steam. In some plate systems cold brine instead of ammonia is circulated through the cooling coils. In the plate system the water in contact with the freezing plates is agitated by means of compressed air which is admitted from a perforated pipe placed near the bottom of the tank. As the ice freezes from one side only it forces the impurities and the air contained in the water to its surface, and the circulation produced by the air bubbles floating upward through the water assists in removing the impurities and air bubbles from the surface. A clear transparent ice is thus produced.

In the so-called vacuum ice-making machines water is used as a working fluid, and it is cooled to the freezing point by its own evaporation. In these machines the water is injected into a refrigerating chamber in which a vacuum is maintained and a portion of the water is frozen by the cooling effect produced by the evaporation. In some machines the vacuum is maintained entirely by mechanical means and in others by the combination of an air pump and a reservoir of strong sulphuric acid for absorbing the water vapor. Where acid is used it is heated after it has become weak through the absorption of water vapor and after concentration is returned to the machine and used over again as an absorbent. Where a vacuum is maintained entirely by mechanical means a very large cylinder displacement is required in the air-pump. One machine constructed on this principle had a cylinder 20 feet in diameter and a stroke of 10 feet, and made 20 double strokes or revolutions per minute. The ice produced is white, opaque and hard. It is produced in large cakes and cut by a saw to the size required for commercial use.

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**REFRIGERATOR,** a machine or apparatus employed to reduce temperature by chemical or mechanical means. In the restricted sense in which it is most familiarly understood, the term refers to any vessel or chamber in which animal and vegetable substances, solid or liquid, are kept, and are prevented from decaying or fermenting, by the presence of ice, or freezing mixtures, or by the circulation of currents of air or liquid furnished by a refrigerating machine. Domestic refrigerators of this character are made in a great variety of forms, ranging from the common metal-lined wooden ice-box, provided with a tube to drain off the water from the melting ice in the ice chamber, to the large and elaborate ice-rooms used for extensive storage purposes.

Domestic Refrigerator.

Refrigerator cars employed to transport perishable merchandise without deterioration over long distances may also be considered as belonging to this class. They were first operated in 1867, between Chicago and New York City, and succeeded in keeping the meat transported fresh and sweet through an interval of 10 days, during the hottest summer months. Each end of a car is provided with a chamber in which blocks of ice are packed on gratings in such a manner as to permit the circulation of a current of air, furnished by a blower driven by a belt on one of the axles, over the ice and through the storage space in the car. See REFRIGERATION AND REFRIGERATING MACHINERY.

**REFUGE, Cities of,** six Levitical cities divinely appointed as places of refuge to one who had committed manslaughter, and was pursued by the «Revenger» or «Avenger» of Blood. Three (Kedesh Naphtali, Shechem and Hebron) were west of the Jordan, and three (Bezer in Reuben, Ramoth Gilead in Gad, and Golan in the half-tribe of Manasseh) were east of that river. If the case was proved to be one of murder, the perpetrator might be taken from the City of Refuge and put to death; if it was only manslaughter, the refugee had to remain in the city to which he had fled till released by the death of the high priest (Num. xxx, 6–34; Josh. xx, 1–9).

It was provided that the cities of refuge should be easy of access, and every year, on the 15th of Adar, the magistrates inspected the roads to see that they were in good condition, and that there were no impediments. At every division of the road was a direction post for the guidance of him who was fleeing for security. Those in flight were to be well supplied with water and provisions, and it was necessary that all should understand a trade so as not to become public charges. At the death of the high priest the refugee might quit the city in which he had sought security, but, according to Num. xxxv, 12, he had to stand trial to determine whether the murder was truly casual and involuntary. If pronounced innocent he was permitted to remain in safety; if otherwise he was put to death according to the law.

**REFUGEES,** rěf'ū-jēs', a name commonly applied to political or religious exiles, but originally and particularly to the French Protestants who fled from their native country on account of the persecutions to which they were exposed after the repeal in 1685 of the Edict of Nantes, under which the reformed doctrines had enjoyed toleration from the year 1598. About 800,000 Protestants fled from their native country. England, Denmark, Holland, Switzerland, Germany, in the latter especially Saxony, Brandenburg and Hesse, received these fugitives with hospitality. In the Civil War in the United States the term was applied to those negroes of the South who before and after Lincoln's Emancipation proclamation sought freedom in the Northern States. See HUGUENOTS.

**REFUNDERS.** See READJUSTERS.

**REGATTA,** originally a gondola race held annually with great pomp in Venice on the canals intersecting the city. The term is now popularly employed in the United States and other countries to signify a showy sailing or rowing race, in which a number of yachts or boats contend for prizes.

**REGELATION,** rē-jē-lā'shŏn, a phenomenon observed by Faraday in 1850, namely, that two pieces of moist ice placed in contact will freeze together, even in a warm atmosphere. It is proved that beside the pressure from the weight of the upper piece of ice there is atmospheric pressure holding the two pieces together; this pressure melts the ice at the parts which bear on one another, and thus enough heat is absorbed to produce regelation. A snowball is formed by the regelation of the particles composing it; so also are the snow bridges spanning chasms on high mountains. The phenomena or regelation are easily seen in the making of snow balls, which is well known to be impossible, by the hands at least, when the snow has been exposed to great cold, and is therefore dry. Professor Thomson's discovery, that the freezing-point is lowered by pressure, explains the motions of glaciers and the apparent plasticity of ice under pressure.

**REGENERATION,** the act or the state of being born again in a spiritual sense. The word is a literal version of the term *palingenesia,* peculiar to the New Testament, in which it occurs twice only, namely, Mat. xix, 28, where it signifies the renovation of all things at the second coming of Messiah; and Titus iii, 5, «washing of regeneration,» where it signifies a new life, a new spirit in the individual redeemed soul. In many other passages of the New Testament, and specially in John iii, 1–10, the new birth is spoken of without the use of the word regeneration, but in such terms as plainly to indicate that the soul which is received into the kingdom of Christ is born into a new life. Regarding the relation of the sacrament of baptism to the new birth there are chiefly two divergent views entertained by divines. One view, which till the Reformation was well nigh universal, and which is still held by the Catholic Church as an article of faith, regards baptism as the agency whereby the Holy Spirit bestows the new life. According to the other view the washing of water in baptism is but a sensible representation of the spiritual new birth, and regeneration is effected independently of baptism by the direct action of the Holy Spirit. The first view is called that of «baptismal regeneration.» Article XXVII of the Articles of Religion of the Church of England teaches that baptism is «a sign of regeneration whereby, as by an instrument, they that receive baptism are grafted into the Church»; but in 1849, by a judgment of the Privy Council, it was decided that in the Established Church of England Baptismal Regeneration is not a doctrine taught in her articles and formularies as legally construed. See MAN, CHRISTIAN ANTHROPOLOGY.

**REGENERATION,** *in zoology,* signifies the reproduction, or natural restoration, of parts of the body, whether external or internal, lost by injury. This power of renewal belongs in some degree to all living creatures, and is one of the distinguishing features of organic, as distinct from inorganic, nature. A broken crystal may rebuild itself when it is allowed to remain for a suitable time in a saturated solution of the mineral of which it consists; but this renewal is accomplished wholly by external accretion of new material, whereas an animal supplies a lost part wholly by the ordinary process of food-assimilation and growth.

This power is most manifest, as might be predicted, in the animals of the simplest organization, and in those most exposed to serious mutilation, and decreases in a varying scale as organisms become more and more complex, until in the higher vertebrates (except lizards) it is limited to the healing of wounds. (The success of what surgeons call *grafting,* that is, the organic attachment of new flesh to old, as when detached skin is placed over a flayed surface, might be classified here, but it is an artificial utilization of the regenerative principle).

Among such lowly animals as protozoans, cœlenterates, echinoderms and worms, the power of regeneration is very great and of much importance, although it appears with much inequality and with some strange irregularities; among crustaceans it is strong in some groups and not in others; and among the vertebrates is confined mainly to the amphibians and the lizards.

As long ago as the middle of the 18th century it was learned that if a hydra be sliced into thin cross-sections from each ring would sprout a fringe of tentacles, and when cut lengthwise into strips each strip would form for itself a complete hydra. The same thing happens when protozoans, and even some worms, are dissected. «If,» says Morgan, «a fresh-water worm (*Lumbriculus*) is cut into pieces, each piece makes a new head at its anterior end, and a new tail at the posterior end; in this way as many new worms are produced as there are pieces.» Not all worms are so energetic. Thus in the common earthworm the cutting must be done carefully. «If from one to five of the anterior segments be cut off,» according to Packard, «the same number comes back; if more are cut off the process of regeneration begins only after a longer interval, and only four or five segments come back as a rule; if the cut be behind the middle . . . fewer worms succeed in regenerating at all.» In the case of another annelid (*Allolobophora*) allied to the earthworm, when cut in two in the middle the posterior piece «regenerates at its anterior cut end not a head but a tail.» This is one of the many curious examples of inconsistency or irregularity in this function. In the hydroids the presence or absence of light has much to do with the form regeneration will take, and elsewhere other external conditions are influential.

Among the echinoderms regeneration is most conspicuous is the starfishes. Before this ability was generally known the oystermen of Long Island Sound, whose planted oyster-beds were infested with destructive starfishes, used to catch great numbers of them by dragging «tangles»; piling them on the deck of the boat they would, as an easy means of dispatching them quickly, saw through the heaps by pulling a coarse cord and then throw the severed halves overboard. The result was that each half of the starfish (unless its centre was utterly ruined) put forth new arms, and thus the number of pests was doubled instead of decreased. Now the starfishes caught are taken ashore and turned into fertilizer.

Crabs and other crustaceans will develop new limbs to replace lost ones. «If,» says Calman (‹Life of Crustacea,› 1911), «a lobster be caught by one of its claws or by a leg, it very readily parts with the limb in its struggles to escape»; and he explains that the connection at the joint of the second and third segments is slight, and that there is only a small hole through which blood vessels and nerves pass to the distal segments, and this is quickly plugged by a blood-clot. «Beneath the scar which forms on the stump of a separated limb a sort of bud grows, and gradually assumes the form of the lost segments . . . and ultimately provides in normal cases a new member, similar in every detail to that which has been lost.»

Amphibians, especially salamanders and the young frogs, suffer greatly from mutilation, not only by enemies who catch them by the tail or a limb, which may be lost in the effort to escape (in some cases by voluntary sloughing off of tail or gills), but by the biting of their own fellows, especially when many larvæ are associated. Salamanders are particularly subject to loss or mutilation of their long tails. These, and lost hands, are restored in the course of three or four months; but in place of the bones that formerly existed in the part a similar cartilaginous framework only is supplied. Fully grown frogs are slower than the young and often the restoration is incomplete.

The same is true of lizards, whose tails are frequently torn or cast off and regenerated. The new structure is, however, as Gadow says, «a sham tail, since neither new centra nor arches [of the vertebræ] but only a non-segmented rod or tube of fibro-cartilage is produced.» Gadow (‹Amphibia,› 1901) continues: «The regenerated tail is, however, provided with new muscles, and with skin, but the scales often differ considerably from those of the normal organ. Boulenger has found that the new r aberrant scaling is in some cases a reversion to an ancestral form. This, for instance, is the case in Pseudopus, and in the tejoid genus *Gymnophthalmus;* to a certain extent also in geckos and skinks. On the other hand *Lacertidæ, Gherrosauridæ* and also *Anguidæ,* reproduce a caudal scaling true to their type. Injured or broken-off tails are often reproduced double or even trifid; sometimes an additional little tail grows out from an injured spot, anywhere on the side of an injured or mended tail.»

Turtles will mend injured plates of their shell, or in some cases are able to reproduce a plate wholly lost.

The physiological process or method by which regeneration is effected through the cells at the surface of the injury or amputation is still a matter of theory. The latest statement of the power of regeneration manifested by the cells concerned is that by Henry Fairfield Osborne (‹Origin of Life and Evolution,› 1917), who believes that such «regeneration is attributable to the potentiality of the hereditary chromatin which still resides in the cells of the amputated surfaces.» It has been argued by some of the stricter followers of Darwin that this power of regeneration is an acquirement through natural selection, but Morgan shows conclusively that this view is untenable. He speaks of the healing of wounds, which occurs in all animals, and asserts that its higher manifestation in the restoration of lost limbs is adaptive in character. «The immense usefulness of this power,» Morgan reminds us, «is obvious when it is remembered how exposed most animals are to injuries. By repairing the injury the animal can better carry on its normal functions. Moreover the presence of the wound would give injurious bacteria a ready means of entering the body. In fact, an intact skin is one of the best preventives to the entrance of bacteria.» Consult Morgan, T. H., ‹Regeneration› (New York 1901).

Ernest Ingersoll.

**REGENERATION IN PLANTS.** See Plants, Regeneration in.

**REGENSBURG,** rā'gĕns-boorg, See Ratisbon.

**REGENT,** rē'jĕnt, in a general sense, is a ruler, the ruler of a state; in a more limited sense, one who exercises the highest power vicariously during the absence or incapacity of the lawful sovereign.

In the United States the term regent has two very special applications, viz.: (1) The Smithsonian Institution in Washington, D. C., is under the direction of a board of regents comprising the President of the United States, Chief Justice of the Supreme Court, three members each of the Senate and House of Representatives, and six citizens appointed by joint resolution of the Congress; (2) the University of the State of New York, a supervising, not a teaching, institution, is under the direction of a board of regents, elected by the legislature, by whom all charters of academies, colleges, universities, libraries and museums in the State are issued.

**REGENT-BIRD**, a bird of eastern Australia (*Sericulus chrysocephalus*), allied to the bower-birds, which derives its name from the golden color of the head. The bower of the Regent bird (which derives its popular name from the fact that it was discovered during the regency of the Prince of Wales, afterward George IV) is smaller and less dome-shaped than that of the Satin-bird. It is sometimes, but erroneously called the Regent-oriole. The males possess a brilliant plumage of glossy satin-like texture and of black and yellow colors, but the females are dingy in appearance. The regent-birds are of very shy habits, and inhabit the forest depths, making bowers less complicated and striking than those of some other bower-birds (q.v.), but for the same purpose. The food consists of fruits and seeds principally. One of the honey-eaters is called mock regent-bird on account of its black and yellow plumage.

**REGENT DIAMOND.** See Diamond.

**REGENT'S PARK,** London, England, one of the principal metropolitan pleasure-grounds, covering 470 acres, in the western boroughs of Marylebone and Saint Pancras. The Zoological Gardens are in the northern section of the park, and the Royal Botanic Gardens occupy a circular area in the southern section. See London.

**REGER,** rā'gĕr, **Max**, German composer: b. Brand, Bavaria, 19 March 1873; d. Jena, 12 March 1916. He removed with his family to Weiden in 1874, and received his early musical training under his father and an organist named Lindner. In 1890–95 he studied under Riemann at Sondershausen and at the Conservatorium at Wiesbaden. He was a teacher at the Conservatorium in 1895–96, performed military service in 1896–97, and in 1901 settled in Munich. He went to Leipzig in 1907, becoming director at the university and teacher of composition at the Conservatory, and in 1908 he became professor at the university. In 1911 he was appointed court conductor of the Meiningen Orchestra by the Duke of Meiningen. He occupied a foremost place among modern German composers of chamber and church music and by many critics is considered the logical successor of the great German masters, Bach, Beethoven and Brahms. His work was highly individual and his facility in the art of counterpoint remarkable; although the complexities of his expression in harmony, rhythm and form are at times difficult to follow, even for experienced listeners. His power of invention was extraordinary and the volume of his compositions enormous, his Opus 100 being completed when he was 34. His works for the organ are ranked next to Bach's. Besides chamber music, choral works with orchestra, piano pieces and several hundred songs he made numerous transcriptions of songs, orchestral and organ works for the piano. Among his organ works are ‹Fantasie and Fugue in C minor› (Op. 29); ‹Sonata, F sharp minor› (Op. 33); ‹Fantasie and Fugue on Bach› (Op. 46); ‹Variations and Fugue on an Original Theme› (Op. 73); ‹Introduction, Passacaglia and Fugue› (Op. 127); his works for the pianoforte include ‹Improvisation› (Op. 18); ‹Aquarellen› (Op. 25); ‹Sonata for piano and violin› (Op. 72); ‹Sonata for piano and violincello in F› (Op. 78), and among his orchestral works are ‹Sinfonietta› (Op. 90; his first opus for orchestra); ‹Ouverture zu einem Lustspiel› (Op. 120); ‹Klavierkonzert› (Op. 114). He explained something of his method in ‹Beiträge zur Modulationslehre› (1903).

**REGGIO DI CALABRIA**, rĕd′jō dē kä-lä′brē-ä, Italy: (1) capital of a province of same name, a seaport town opposite Messina at the extreme southern point of the peninsula. Reggio was founded by Greek colonists in the 8th century becoming later a Roman possession. Ancient Græco-Roman baths were recently revealed in excavating. It fell alternately into the hands of Saracens, Spaniards and Turks, and in 1783 and 1908 its ruin was almost completed by earthquakes. Its chief industries are the manufacture of essential oils, olive oil, silk and printing. Pop. 43,162. (2) The province is rugged and mountainous, covering an area of 1,219 square miles; pop. 469,071.

**REGGIO NELL' EMILIA**, nĕl lā-mĕl′lē-ä, Italy, (1) capital of the province of the same name, 38 miles northwest of Bologna, on the canal of Tassone. It is well-built and enterprising. Its chief points of interest are its ancient walls and ramparts, cathedral and library. Ariosto and Spallanzane (qq.v.) were born in Reggio. Pop. (1915) 75,349. (2) The province lies between Parma on the west and Modena on the east. Its southwest portion is covered by the Apennines. The opposite portion is flat and alluvial, bordering the Po. Area, 885 square miles; pop. 326,487.

**REGICIDE**, a term applied to persons who bring about the death of a king, by assassination or otherwise and specially applied in history to the judges of Charles I, and the members of the French Convention who voted for the death of Louis XVI. Of the judges, 67 in number, who actually sat in trial on Charles I, only 59 signed the death warrant. After the Restoration the regicides were brought to trial on a charge of high treason. Twenty-nine were condemned to death, but only 10 were executed, 19, together with six others who were not tried, being imprisoned, most of them for life. More than 20 who were already dead were tried and condemned, notwithstanding, and Cromwell, Ireton and Bradshaw, three of them, were exhumed and hanged at Tyburn and then reburied at the foot of the scaffold.

In July 1660, there arrived at Cambridge, Mass., Edward Whalley and his son-in-law, William Goffe, two of the judges who had condemned Charles I. For some months they appeared in public and joined in the devotional meetings in Cambridge and Boston, where they were kindly received. Upon the news of the passage by Parliament of the Indemnity Act. marking Whalley and Goffe for vengeance as regicides, they fled to New Haven and were received and concealed by Davenport in the «Judges' Cave.» They were concealed from pursuit at New Haven and Milford for nearly two years. After this they fled to a cave in New Hampshire, but were there discovered by some Indians and returned to Hadley, Mass., where they were concealed until their death, Whalley dying in 1674, Goffe in 1679. When King Philip attacked Hadley in 1675, Goffe appeared and led the defense. Dixwell, another regicide, also escaped to New England.

In the broad sense of assassinations of rulers under various titles we have since 1800 the following: Tsar Paul, Russia, 24 March 1801; President Lincoln, (died) 15 April 1865; Prince Michael, Servia, 10 June 1868; Sultan Abdul-Aziz, Turkey, 4 June 1876; Tsar Alexander II, Russia, 13 March 1881; President Garfield, (died) 19 Sept. 1881; President Sadi Carnot, France, 24 June 1894; President Juan Idiarte, Uruguay, 25 Aug. 1897; President Heureaux, Santo Domingo, 26 July 1899; King Humbert, Italy, 29 July 1900; President McKinley (died) 14 Sept. 1901; King Alexander, Servia, 10 June 1903; King Carlos I, Portugal, 1 Feb. 1908; President Madero, Mexico, 23 Feb. 1913; King George, Greece, 18 March 1913; President Sam, Haiti, 1915; Nicholas II, Russia, July 1918.

**REGILLUS**, rĕ-jĭl′ŭs, **Lake**, a lake of ancient Latium, lying to the southeast of Rome, noted as the scene of a great victory won by the Romans under Albinus Postumius, over the Latins, under Octavius Mamilius, on behalf of the banished Tarquin the Proud, 496 B.C. No certain identity has been established with any modern lake.

**REGIMENT.** In modern armies the regiment is a colonel's command and is the largest *permanent* association of soldiers. Regiments may be combined into brigades, brigades into divisions and divisions into armies; but these combinations are but temporary, while in the regiment the same officers serve continually and in command of the same body of men. The strength of a regiment may vary greatly even in the same army, as each may comprise any number of battalions. In the cavalry, field artillery and infantry arms the regiment is the administrative unit. The headquarters of the regiment are at the station of the permanent regimental commander; in his absence the command of the regiment devolves upon the senior officer on duty with it wherever he may be stationed. The regiment is composed of two or more battalions which, in turn, are composed of two or more companies. The battalion, in a regiment, is not an administrative unit and has no separate records; it is purely a tactical unit conveniently organized for instruction or maneuver and particularly for combat, either as an integral part of the regiment to which it belongs or separated from it. It is appropriately commanded by a field officer, normally a major, regularly assigned in orders. In the absence of its regular commander the command devolves upon the senior officer of the battalion on duty with it, unless a field officer has been assigned. Whenever incomplete battalions of the same or different regiments are serving together, the commanding officer designates provisional battalions and similarly, in the case of the incomplete regiments, he designates provisional regiments. Under the new organization plan of 22 Sept. 1917, an infantry regiment in the United States army contains one headquarters and headquarters company (303), three battalions of four line companies each (3,078), one supply company (140), one machine-gun company (178), one medical detachment (56), making a total of 3,755 officers and men. For the composition of the companies, battalions, etc. See ARMY ORGANIZATION.

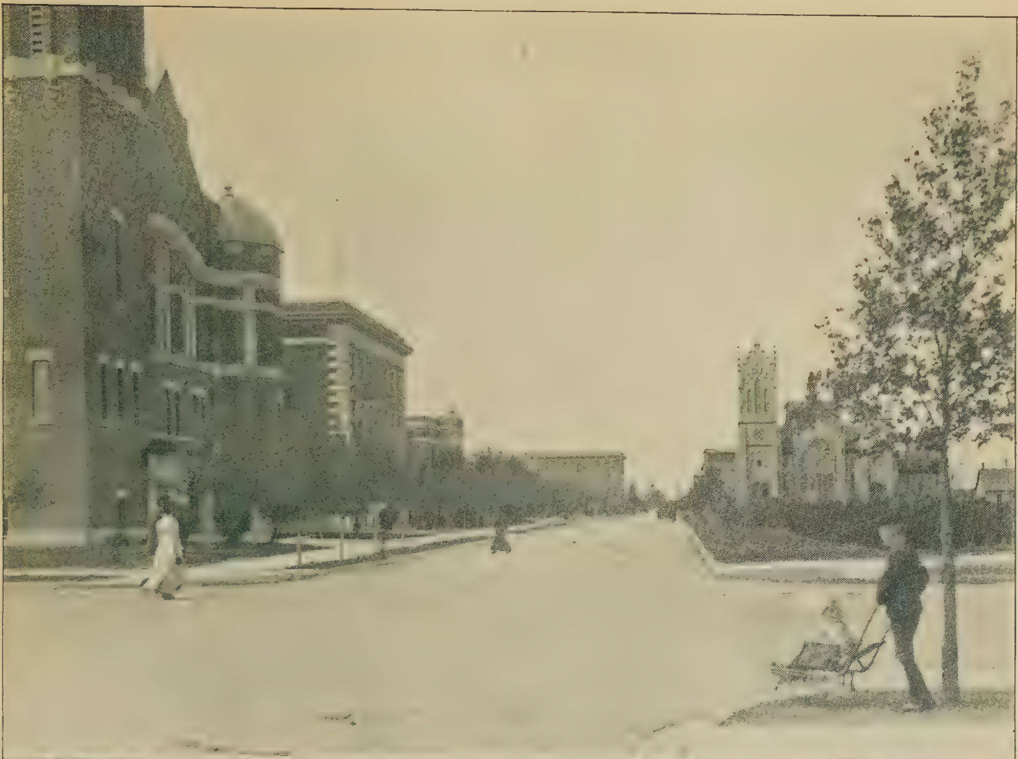
**REGINA**, Canada, city and capital of the province of Saskatchewan and for many years previous to 1905 the capital of the North West Territories, the commercial, educational, social, political and industrial centre of that prairie country lying between Winnipeg and the Rocky Mountains and the largest city between Winnipeg (356 miles east) and Calgary (840 miles west). The main line of the Canadian Pacific Railway cuts the city from east to west. The Colonsay line of the same railway enters from the north and has its terminus there. The Bulyea line of the Canadian Pacific Railway also connects Regina with the northern portion of the province east of Last Mountain Lake, and with the Kirkella branch serving the eastern portion of the province north of the Qu'Appelle Valley. The Arcola line of the Canadian Pacific Railway has its western terminus in Regina and serves the southeastern portion of the province. The Weyburn cut-off of the Canadian Pacific Railway connects Regina to the south and by connecting up with the new Lethbridge line opens up the whole of the southwestern portion of the province. It also brings Regina into direct connection with the Soo Line and thereby with Saint Paul, Minneapolis and other American cities. The Canadian National Railways have a line running east from Regina which connects with their main Transcontinental at Winnipeg. They also own the old Qu'Appelle, Long Lake and Saskatchewan Railway from Regina to Prince Albert and continuing on to the Hudson's Bay. Their line to Moose Jaw from Regina is a recent addition serving a rich stretch of country. The Grand Trunk Pacific has a line from Regina to Melville connecting with their main Transcontinental, one to Moose Jaw and another south to the international boundary line connecting with the Great Northern. The chief industry of the Canadian west is agriculture and stock-raising, and Regina is the centre of both for Saskatchewan. The land is a rich clay loam, producing excellent crops of small grains and roots. Seed grain from the district is sold throughout the continent at excellent prices. Nearly all the great implement houses have headquarters for Western Canada in Regina and a few years ago the city held the record for implement sales for all the world. Regina may be said, therefore, to be the heart of the implement trade of the West. All the leading wholesale houses have branches in Regina and an immense volume of trade is done. The city has laid out a tract of property a mile long and half a mile deep for a wholesale and manufacturing district. This is served by all lines of railways operating in the district and is already over half full of permanent and substantial business structures. Among recent additions to this district are branches of the T. Eaton Company and the Robert Simpson Company, both of Toronto and the two largest enterprises of their kind in Canada. The Imperial Oil Company (Standard Oil) have a refining plant at Regina devoted to refining crude oil shipped in tank cars from Wyoming. The Canadian Continental Oil Company recently removed its headquarters to Regina.

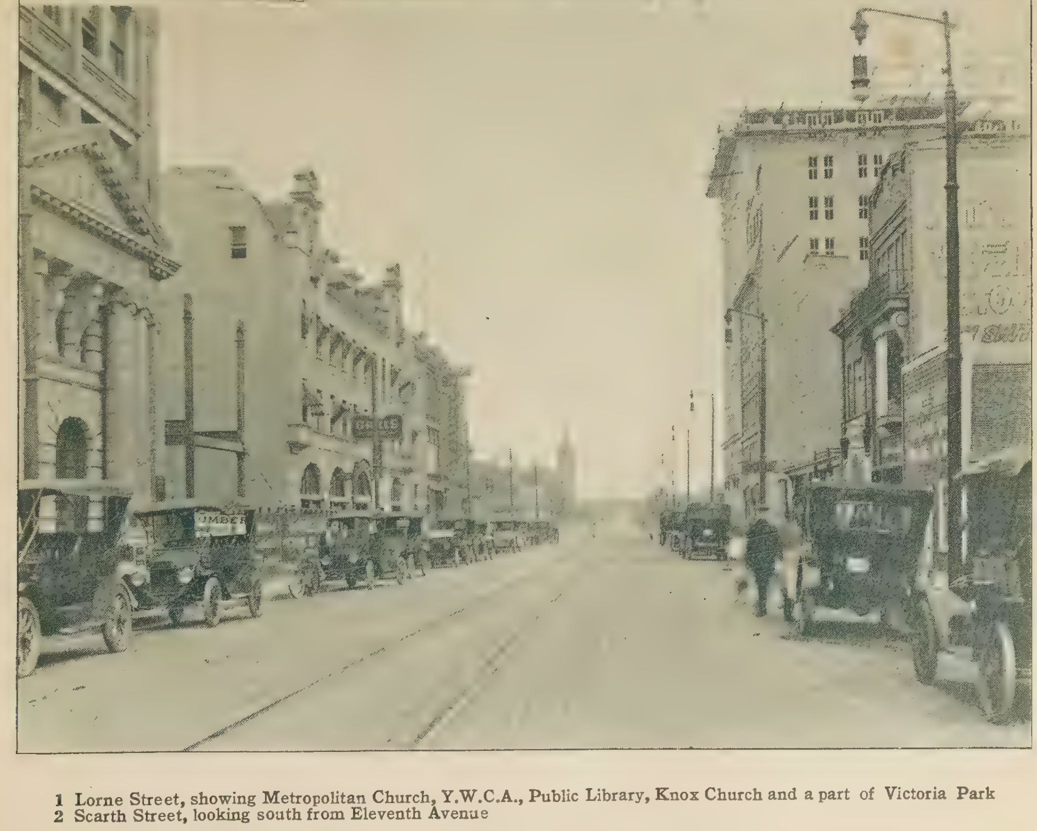
A large Canadian pork-packing firm recently established a plant in Regina. Most of the great Canadian and many of the American financial houses have branches located in Regina. There are 15 branches of chartered banks and numerous trust companies. The bank clearings for 1910 were $50,739,159, and for 1918 they were $184,624,632. The city is governed by an elected mayor and 10 aldermen. Municipal ownership is at its best in Regina, the municipality owning and operating its own water plant, light plant and street railway. The city is well supplied with parks and beauty spots and it is prettily situated on the banks of Wascana Lake. Within easy motor distance are several noted summer resorts on the Qu'Appelle and Last Mountain lakes. Its educational facilities comprise a fine collegiate institute and two colleges (Methodist and Anglican) while Presbyterian and Roman Catholic colleges are projected. All religious denominations are well represented with large congregations and commodious churches. There are also numerous public buildings of magnificent proportion and architectural beauty.

The city was founded in 1883 and was originally called Pile of Bones, due to the great piles of buffalo bones in the vicinity. It grew slowly until 1905 when it rose by successive strides of healthy growth from 2,249 in 1891 to about 40,000 souls to-day. Headquarters for Canada of the Royal North West Mounted Police are located in Regina, as is also the military headquarters for the province. During the war of 1914–18 the city responded nobly, having sent four battalions into the field as fighting units and raised many men for reinforcements.

**REGIOMONTANUS**, rē″jĭ-ō-mŏn-tā′nŭs, German astronomer, whose real name was Johann Müller, but who assumed that of Regiomontanus, in allusion to the place of his birth, Königsberg (Kings Mountain), Fran-

# REGINA, CANADA





1 Lorne Street, showing Metropolitan Church, Y.W.C.A., Public Library, Knox Church and a part of Victoria Park
2 Scarth Street, looking south from Eleventh Avenue

1 View from Wascana Park, showing Collegiate Institute, Regina College and Normal School
2 Victoria Park

conia: b. 6 June 1436; d. Rome, 6 July 1476. Having received a classical education at Leipzig, he placed himself under Purbachius (Georg von Purbach), the professor of mathematics at Vienna, and under him became one of the first astronomers of that age. With Purbachius he accompanied Cardinal Bessarion to Rome in 1461, where Beza gave him further instruction in Greek literature, and he now completed a new abridgment in Latin of the ‘Almagest’ of Ptolemy (1496), correcting many errors in the former translation, made by George of Trebizond. In 1471 he built an observatory at Nuremberg and established a press, but after three years returned to Rome on the invitation of Sixtus IV, who employed him in the reformation of the calendar and rewarded his services by raising him to the bishopric of Ratisbon (1475). He died, according to some, of the plague, according to others by poison administered by the son of George of Trebizond out of revenge for his having exposed the errors of his father. Regiomontanus was the first in Germany to apply himself to the cultivation of the neglected science of algebra. He made great improvements in trigonometry, into which he introduced the use of tangents. His refutation of a supposed discovery of the quadrature of the circle and numerous writings on various subjects of natural philosophy display extensive learning and great acuteness. His astronomical observations from 1475 to 1506 (‘Ephemerides’) are very accurate. Among his other works ‘Kalendarium’ (about 1474), ‘De Reformatione Kalendarii’ (1489); ‘De Cometæ Magnitudine Longitudineque’ (1531); ‘De Triangulis Omnimodis’ (1533); ‘Tabulæ Directionum Prejectionumque in Nativitatibus multum utiles’ (1585). Consult Gunther, ‘Johannes Müller’ (in the ‘Allgemeine deutsche Biographie,’ Vol. XXII, 1855); also Ziegler, ‘Regiomontanus als, geistiger Vorläfer des Columbus’ (1874).

**REGIONAL METAMORPHISM.** See METAMORPHISM.

**REGISTER,** the title of a public officer who has charge of records, his duties varying in different States; a list of persons entitled to vote; a perforated plate governing the opening into a duct which admits warm air into a room for heat, or fresh air for ventilation, or which allows foul air to escape; in music, the compass of a voice or instrument. Also a device for automatically indicating the number of revolutions made or amount of work done by machinery; or recording steam, air or water pressure, or other data, by means of apparatus deriving motion from the object or objects whose force, distance, velocity, direction, elevation or numerical amount it is desired to ascertain. There are various appliances of this kind, each particularly adapted for the peculiar operation which is to be investigated; many depending on the action of clockwork mechanism, which indicates results on dials, but others, as in registering meteorological instruments, having means for recording varying conditions, as with the anemometer, barograph, etc. The cash register is a machine for recording money payments. It is of very general use in retail establishments throughout the world.

**REGISTRATION OF BIRTHS, MARRIAGES AND DEATHS.** France has the most perfect system of registering births, marriages and deaths. There it is the duty wholly of the civil authority, and the methods are so thorough and comprehensive that it is practically impossible for a birth, a marriage or death to occur without going on record. In Great Britain no thorough system existed till 1836, when a general registration act was passed, applicable, however, only to England and Wales, which has been considerably amended since. In the United States, while there is no national law on the subject, the registration of births, marriages and deaths is universally required by State laws, but it is only in well-organized municipalities that it is fully enforced, and even there much depends on the willingness of doctor, minister or other civilian upon whom the law imposes the duty of making report to the authorities, to perform that duty. In rural and remote districts births, marriages and deaths often go unrecorded, thus causing doubt and uncertainty which may cast a cloud on property titles and the legitimacy of children. Claims to great age are often made more than doubtful by the lack of any authentic evidence as to date of birth. Indeed, owing to the lax methods of registration which prevailed up to the latter part of the 19th century it is almost impossible to establish the pretensions of alleged centenarians. The importance of registration has of late, however, impressed itself deeply on the public, and everywhere throughout the United States an improvement is being witnessed in this regard.

**REGISTRATION OF PROPERTY TITLES.** The United States leads the world in its system — which is practically the same everywhere throughout the Union — of recording property transfers. The possession of a deed of property is not proof of title. The title rests legally in the person in whose name it is recorded in the books of the register or recorder, or by whatsoever name the official having charge of such records is known. The first business, therefore, of a person acquiring property is to have the deed registered. Otherwise the former owner could sell the same property to another, and if the latter had received no notice of a previous transfer, and gave value for the estate, and had his deed recorded first, he could hold the property against the person who had received a previous deed, but had failed to put it on record. The officials in charge of the records are sometimes county and sometimes town and city officers, and the deed is recorded the moment it is received, even although not entered on the books for some time after. Therefore it is carefully stamped with the hour, minute and even second of its presentation. The old cumbersome English method of vesting title on a trunkful of deeds is, therefore, unknown in America, where registration has been the rule from the time of the earliest settlers, who allotted lands to each freeman, and made a record of the division.

Chattel mortgages are also recorded; otherwise the mortgagee is without protection against transfer to a third and innocent party who might purchase the goods, or advance money on them.

England has been slow to follow the example of the United States in this matter, but the convenience of the American system and the cumbersomeness of the English, which was growing more top-heavy year by year, has led to the adoption of a method of voluntary registration which makes it possible to transfer and hold property without having to hand over or keep a mass of old title-deeds. In Scotland an excellent system for the registration of transfers of heritable property has existed since 1617.

**REGISTRATION OF VOTERS.** Unrestricted and general registration of voters is required by law in 40 of the American States, as a check to fraudulent voting; in two there are no registration requirements; in the others a restricted registration is required, as in cities and towns of specified population, in certain cities, towns and villages that have become incorporated, in cities but not in country precincts, etc. In some States a voter having once registered is not required to register again while he retains the same qualifications and residence. In the State of New York yearly registration is required in the large cities, while in the country districts it is not necessary. Previous to registration «repeating» — that is, voting more than once in one election — and other frauds were very common and probably affected the results of important political contests. The voter is required, as a rule, to give his name, age, residence, place of birth and, if of foreign birth, produce his naturalization papers, should the registering officials demand them. For a short time New York State had a law requiring the registry board to make a record of the physical defects of voters for identification, but this proved offensive and unpopular and was soon repealed. It is a penal offense to make a false statement in registering. See various articles dealing with voting and suffrage.

In Great Britain and on the Continent of Europe voters are required to register, a most exact scrutiny being enforced as to the possession of legal qualifications for the suffrage.

In England the registration of electors was first established by the Reform Act of 1832, in terms of which, in England, the overseers of each parish were required to draw up a register of all persons qualified to vote. This still forms the basis of procedure, but the law has been frequently altered, the latest act on the subject being the Registration Act of 1885.

**REGISTRY BOARDS, Election of.** See ELECTIONS; ELECTORAL QUALIFICATIONS; CONGRESS.

**REGISTRY OF VESSELS,** legal term applied to the record of United States merchant ships engaged in foreign trade, kept in the customs office of their home port. Ships engaged in coastwise or home trade are «enrolled,» the terms «register» and «enrolment» being used to distinguish the two classes of vessels. The ship receives a registry certificate giving her home port, date of construction, name of owner, measurements and tonnage, her official number and signal letters. «Registry of tonnage» is the amount of weight a ship will carry as expressed in the official register.

**REGIUM DONUM,** rē'jĭ-ŭm dō'nŭm («royal gift»), an annual grant of public money formerly received by the Presbyterian and other Non-Conformist ministers in England, Scotland and Ireland. The Irish Regium Donum was withdrawn by the Act of 1869, which came into force in 1871, disendowing the Irish Episcopal Church. Compensation was made of life interests, and the ministers were allowed to commute on the same terms as the clergy of the Church. In 1874 it was reported that the commutation money paid had amounted to $2,898,810. The Regium Donum in England was enjoyed by the three denominations, Presbyterians, Independents and Baptists, from 1723 till 1851. The amount required was annually voted by Parliament till 17 July 1857. The Scotch Episcopalians also enjoyed for a time a small share.

**REGIUS** (rē'jĭ-ŭs) **PROFESSORS,** the designation of professors at Oxford and Cambridge whose chairs were founded by Henry VIII. In the Scotch universities the name is given to professors who receive their appointments from the Crown.

**REGLA,** rāg'lä, Cuba, town, province of La Habana, on Havana Harbor, opposite the city of Havana. It is connected with Havana by ferry, with Matanzas and other towns to the east by rail, and also has a street railway running to Guanabacao. It contains foundries, shipyards and large sugar warehouses, and has a considerable trade, especially in the exporting of sugar. It contains a large bull ring, formerly the scene of the Havana bull fights. Pop. about 14,000.

**REGNARD,** rĕ-när, **Jean François,** French comic dramatist: b. Paris, 1 Feb. 1655; d. Grillon, 4 Sept. 1709. He was the son of a rich merchant, and while on a voyage to Italy was captured by pirates and sold as a slave in Algiers. Being redeemed by his family he traveled extensively in Holland, Germany, Poland and Lapland. He wrote many comedies for the French stage, his first, ‹Le Divorce,› was performed at the Theatre Italien in 1688. What is considered his masterpiece is ‹Le Joueur› (1696), which holds a place second only to some of Molière's. Other pieces, produced at the Théâtre-Française, were ‹La Sérénade› (1694); ‹Le Bourgeois de Falaise› (1696); ‹Le Distrait› (1697); ‹Le Carnaval de Venice› — music by Campra — (1699); ‹Democrite› (1700); ‹Le Retour imprévu› (1700); ‹Les Folies amoureuses› (1704); ‹Les Ménechmes› (1705). The best editions of his works are by Didot (1820); Michiels (1854); Fournier (1875); Moland (1893).

**REGNAULT,** rĕ-nō, **Alexandre Georges Henri,** French painter: b. Paris, 30 Oct. 1843; d. Buzenval, 19 Jan. 1871. He was trained in art under Lamothe and Cabanel; in 1866 carried off the Prize of Rome by his ‹Thetis Bringing Weapons to Achilles› and for the next two years lived in Italy, where he furnished illustrations to the ‹Travels› of Francis Weh. He next visited Spain, where his passion for light and color was satisfied in studying the works of Goya and Velasquez, of whose ‹Las Lanzas› he made a copy. In fact, his first work of importance, a colossal equestrian portrait of General Prim (now in the Louvre), was executed at Madrid. He had a natural, temperamental preference for the features of oriental life, and he loved to paint incidents and scenes of horror. Of such a character is his ‹Salome,› a personification of bloodthirsty passion; and ‹Decapitation in Granada›; two canvases of marvelous daring in color, but repulsive from their cold brutality. When the war of 1870 broke out he returned to France, enlisted and was killed at the battle of Buzenval, near Paris. The circumstances of his death have invested his name with a certain halo of glory in the eyes of his countrymen and have tended to impart an exaggerated importance to his artistic achievements. A monument to him by Chapu is seen in the École des Beaux Arts, Paris, and his ‹Automedon with the Horses of Achilles,› in the Boston Museum of Fine Arts. Consult Cazalis, ‹Henri Regnault, so Vie et son Œuvre› (1872).

**REGNAULT, Henri Victor,** French chemist and physicist: b. Aix-la-Chapelle, Germany, 21 July 1810; d. Auteuil, France, 19 Jan. 1878. After study at the École Polytechnique of Paris, he became a mining engineer and later a professor at Lyons. His ‹L'Action du Chlore sur l'Ether Chlorhydrique› (1840) won for him a professorship at the École and admission to the Academy of Sciences. In 1841 he was made professor of physics in the Collège de France, in 1847 chief mining engineer, and in 1854 director of the Sèvres porcelain manufactory. Among his writings, besides many scientific papers in ‹*Annales de Chime*› and other learned journals, are ‹Cours Elémentaire de Chimie› (4 vols., 1849–50; 14th ed., 1871), and ‹Premiers Eléments de Chimie› (1850; 6th ed. 1874). His great work on steam engines constitutes Vol. XXI of the ‹Mémoires de l'Académie des Sciences.›

**REGNAULT, Jean Baptiste,** BARON, French painter: b. Paris, 19 Oct. 1754; d. there, 12 Nov. 1829. He studied under Bardin, won the grand medal with his ‹Alexander and Diogenes› in 1774, and after capturing the Prix de Rome in 1776, entered the Academy in 1783 and became eventually a professor in the École des Beaux Arts (1795). The influence of David was predominant in his day, and Regnault's paintings are all in the conventionally classic manner of that master. Many of his works are in the Louvre, among them his ‹Baptism of Christ,› and his most notable picture, the ‹Education of Achilles.› Among his notable works are ‹Perseus and Andromeda› (1782), and ‹Cupid and Psyche› (1829). He also produced the historically interesting works, ‹The Acceptance of the Constitution by Louis XVI›; ‹Napoleon Proclaimed Consul for Life›; ‹Battle of Marengo,› and ‹The Death of Dessaix.›

**RÉGNIER,** rā-nē-ā, **Henri François Joseph de,** French poet: b. Honfleur, 28 Dec. 1864. He was numbered in his earlier days among the Parnassians and later was allied with Mallarmé and the symbolists. His admirers are found among the younger literary men rather than among the academic. Critics have found his verse excellent for a delicacy of taste and a kind of antique inspiration, but have blamed him for sacrificing too much of the sentiment or the idea to the last refinement of expression. He has published in verse ‹Sites› (1887); ‹Poèms anciens, romanesques› (1890); ‹Tel qu'en songe› (1892); ‹Les Jeux rustiques et divins› (1897); ‹Les Médailles d'Argile› (1900), etc., and the novels ‹La Cânne de Jaspe› (1895); ‹Le Trèfle blanc› (1899); ‹La double Maîtresse› (1900).

**REGNIER, Mathurin,** French satirist: b. Chartres, 21 Dec. 1573; d. Rouen, 22 Oct. 1613. He was a nephew of the poet Desportes; served as secretary in Rome to the ambassadors Joyeuse and Béthune. Having taken orders as a youth he was granted a canonry at Rouen upon his return from Rome, but his dissipated habits shortened his life. He was famous for his satires in imitation of Horace, Juvenal and Martial, especially those in which he attacked Malherbe, the reigning literary authority of his day. He showed knowledge of life and character and a power in the expression of manners that in the opinion of Sainte-Beuve ranked him after Montaigne, Ronsard and Rabelais. No good edition of his works appeared in his lifetime; that published in 1608 and in 1613 was entitled ‹Satires et autres Poésies de Maturin Régnier.› Numerous editions of his works have appeared, including those by Brossette (1729, 1736); Viollet-Leduc (1822, 1853); Barthélemy (1862); Lacour (1867), and Courbet (1869, 1875).

**REGOLITH.** See MANTLE ROCK.

**REGULAR ARMY.** See ARMY; ARMY ORGANIZATIONS; UNITED STATES, ARMY OF.

**REGULAR CANONS OF THE IMMACULATE CONCEPTION.** See ORDERS, RELIGIOUS, *Immaculate Conception, Regular Canons of the.*

**REGULAR CLERKS OF THE FAITH OF JESUS.** See ORDERS, RELIGIOUS, *Baccanarists.*

**REGULARITY, Political.** See VOTE, VOTERS, VOTING.

**REGULARS,** in the Roman Catholic Church, persons of either sex who are members of any of the religious orders, congregations or institutes approved by the Holy See. Those of their number who are in holy orders constitute the Regular Clergy, that is, clergy under a religious rule (*regula*), who are bound by the usual three monastic vows, poverty, chastity and obedience: so contradistinguished from the secular clergy — those clergymen who do not belong to such orders or congregations.

**REGULATION OF PUBLIC UTILITIES.** See PUBLIC UTILITIES.

**REGULATORS,** a name adopted in South Carolina, about 10 years before the Revolution, by citizens who organized themselves to put down lawlessness and enforce respect for life and property. Their methods were very like those of the vigilance committees of California and Nevada, about a century later. The Regulators were pacified by the establishment of courts of law in the disturbed districts.

Some years later in North Carolina an organization calling themselves «Regulators» was formed to resist the extortion and oppression practised by officers of the colonial government. They drove out the local authorities, and Governor Tryon led a military force against them, defeating them after a sanguinary battle, near the Allemance Creek, 16 May 1771. Tryon hanged six of the Regulators for treason. The survivors generally took the patriot side in the War for Independence, and the «Regulator» movement in North Carolina is regarded by some as one of the beginnings of that struggle.

Consult ‹Messages and Papers of the Presidents› (Vol. XX, 1914).

**REGULUS**, rĕg'ū-lŭs, **Marcus Atilius**, Roman general of the 3d century B. C. He was made consul in 267 B.C., and a second time about 256 B.C. With his colleague, Manlius Vulso, he commanded in the first war against Carthage. With a fleet of 330 ships carrying 40,000 men the consuls defeated a superior Carthaginian fleet in the battle of Ecnomus and effected a landing in Africa. Here Regulus followed up his victories so successfully that in a short time he presented himself before the capital of the enemy. Carthage sued for peace and Regulus who wished to end the war before his successor was appointed demanded unconditional submission. The Carthaginians refusing the terms ended the negotiations and at this juncture were joined by a small body of Spartan volunteers under Xanthippus, to whom was given the command of the Carthaginian forces. In a battle under the walls of Carthage 30,000 Romans fell and Regulus was made prisoner 255. He remained in Carthage till 250, when the Carthaginians, having been defeated at Panormus, were desirous of peace. An embassy was, therefore, sent to Rome, accompanied by Regulus, who was obliged to bind himself by an oath to return to Carthage, if Rome should refuse the terms proposed. Regulus, however, advised the continuance of the war and recommended the Romans not to exchange prisoners. Thereupon he declined to listen to the entreaties of his family or of the Senate and peristed in his intention to return to Carthage. It is related that he was put to death with great cruelty and that Hamilcar and Boscar, two noble Carthaginian prisoners, were given up to the family of Regulus, who took revenge on them in a similar manner. Neither the story of the embassy nor of the revenge is related by Polybius, and Ihne, the German historian, inclines to the modern view that the story was invented to excuse the cruelty of the family of Regulus to their prisoners. Niebuhr declares the story a forgery and believes that Regulus died a natural death. Horace ‹Odes› III, 5, repeats eloquently the story as current at the time.

**REGULUS**, the star Alpha Leonis, the brightest in the constellation of the Lion.

**REGUR**, a dark superficial soil of India, loam or clayey, occurring chiefly on the tableland of the Deccan and in Nagpur, less frequently in Mysore and reappearing in southern India in continuous sheets from 6 to 20 feet thick. Although generally a surface soil, it dips beneath recent alluvium. It is extremely fertile, having produced heavy crops, especially of cotton and corn, for many centuries without requiring manure. Its exact age is undetermined. The name is native.

**REHAN**, rē'ạn, **Ada** (originally CREHAN), American actress: b. Limerick, Ireland, 22 April 1860; d. New York, 8 Jan. 1916. She came to this country as a child and made her first appearance on the stage at 14 in Newark, N. J. She had not at that time, however, taken up acting as a profession, but continued her education in Brooklyn where her parents lived. She appeared for two seasons at Mrs. John Drew's theatre in Philadelphia, and later in stock companies in Baltimore, Albany and Louisville. In 1879 she became a member of Augustine Daly's stock company first as leading lady and afterward as star, where she continued until Daly's death in 1899. Here she took part in many revivals of old comedy, together with a fewer number of modern plays, principally adaptations from the German made by Daly. Her greatest successes were Katharine in ‹Taming of the Shrew› and Lady Teazle in ‹School for Scandal,› though she played with acceptance Viola, Portia, Rosalind and Beatrice, Peggy Shrift in ‹The Country Girl› and Agatha Posket in Pinero's ‹The Magistrate.› After 1899 she appeared on the stage only at considerable intervals.

**REHN**, rĕn, **Frank Knox Martin**, American artist: b. Philadelphia, Pa., 12 April 1848; d. Magnolia, Mass., 7 July 1914. He studied at the Philadelphia Academy of Fine Arts and established a reputation as a painter of marines, landscapes and portraits. He attained his greatest successes as a painter of marines. He refrained from studying abroad believing that foreign study tended toward imitation of old masters rather than permitting the development of an individual American school of art. He was awarded honorable mention at the Paris Exposition in 1900 and gold medals at the New York Competitive Prize Fund Exhibition in 1885 and at the Philadelphia Society of Artists in 1907. He was elected a member of the National Academy in 1908. His most important figure piece is ‹The Turkish Harem,› and among his marines are ‹Missing Vessel› (Detroit Art Museum); ‹Close of a Summer Day› (Buffalo Fine Arts Academy); ‹The Derelict› (1892); ‹A Moonlight Sea — Cape Ann› (1912); ‹A Sunny Afternoon in the Gulf Stream› (1914).

**REHOBOAM**, rē'hō-bō'ăm, first king of Judah and, for a time after succeeding his father, king of all Israel, son of King Solomon and the Ammonitish Princess Naamah: b. 1014 B.C.; d. 956 B.C. He succeeded to the throne 973 B.C., and proceeded to Shechem for his coronation. There he was petitioned by the people for a remission of the heavy burdens imposed under Solomon's masterful reign; but, disregarding the advice of his elders, he not only refused the petitions, but announced his intention of being more severe than his father had been. The result was a revolt under the leadership of Jeroboam, who had returned from exile in Egypt. Rehoboam gathered an army of 180,000 men at Jerusalem with the purpose of reconquering Israel. He appears to have been outnumbered by the opposing forces, and his expedition was, moreover, forbidden by the prophet Shemaiah, who declared the division of the kingdom to be the will of God. Rehoboam acquiesced, strengthening his borders and becoming the first king of Judah, the division of the kingdom into two parts continuing to the end of both lines of monarchy. The pure worship of God was maintained in Judah, attracting many settlers from Israel, but Rehoboam did not put down the worship of Ashtoreth, which, according to the chroniclers, was visited with punishment through an Egyptian invasion under Shishak, or Sheshonk. Jerusalem was taken and Rehoboam secured an ignoble peace by delivering to the victor the treasures of King Solomon's temple and palace.

His reign was thereafter uneventful and he was succeeded by his son Abijah, or Abijam.

**REICH, Jacques,** American artist: b. in Hungary, 10 Aug. 1852; d. Runraven, N. Y., 8 July 1923. He studied art in Budapest; came to the United States in 1873; continued his art education in New York, Philadelphia and Paris. He returned to Philadelphia and became skilled in pen-and-ink drawings and in the etching of portraits on copper. In 1885 he removed to New York. He drew the greater number of the pen-portraits for Scribner's ‘Cyclopædia of Painters and Paintings,’ and also for Appleton's ‘Cyclopædia of American Biography.’ His other important work includes a series of portraits of American and English authors and other prominent persons, and half life-size plates of Washington (after the Gilbert Stuart unfinished painting), Jefferson (after the painting by Rembrandt) and President Roosevelt.

**REICHA,** rīk'ʜä, **Anton Joseph,** Austrian composer: b. Prague, Austria, 27 Feb. 1770; d. Paris, France, 28 May 1836. He made a study of the violin, pianoforte and flute and in 1788 he entered the chapel of Maximilian of Austria as second flute. His ambition, however, was to become a composer and after overcoming many difficulties he succeeded in having his symphonies and other compositions played by his uncle's orchestra at the court of the Elector of Cologne. Reicha lived in Hamburg 1794–99 and there wrote his first opera, ‘Obaldi, ou les Français en Egypte,’ but failed to obtain its production in Hamburg or Paris, though several of his symphonies were well received. In 1802–08 he lived in Vienna, where he enjoyed the patronage of Maria Theresa and was intimate with Beethoven, Haydn and other great musicians. He removed to Paris in 1808, became professor at the Conservatoire in 1818, was naturalized in 1829 and elected to the Institute in 1835. He was chiefly notable for his chamber music and his theoretical work, though his symphonies and overtures met with considerable success. His operas were lacking in dramatic effect, though their music is excellent. He was also author of numerous theoretical works, among which may be mentioned ‘Études ou Théories pour le Pianoforte, dirigées d'une Manière nouvelle’ (1800); ‘Traité de Melodie’ (1814, 1832); ‘Cours de composition musicale’ (1818); ‘Traité de haute Composition musicale’ (1824, 1826), edited by Czerny in French and German as ‘Vollstandiges Lehrbuch’ (4 vols., 1834); ‘L'art du Compositeur dramatique’ (1833); ‘Petit traité d'harmonie pratique’ (no date), etc.

**REICHARDT,** rīk'ʜärt, **Johann Friedrich,** German composer and author: b. Königsberg, 25 Nov. 1752; d. Giebichenstein, 27 June 1814. He studied in the universities of Königsberg and Leipzig; was appointed Kapellmeister by Frederick the Great in 1775, and during his tenure of office introduced Concerts Spirituels for the performance of novelties with analytical programs (1783). He conducted Italian opera under Friedrich Wilhelm II, but his French sympathies brought about his dismissal in 1794. He was court director at Cassel for a short time during the incumbency of the king of Westphalia. He holds an important place in the history of music from the fact that his Singspiele are factors in the development of German opera, and his Lieder are among the earliest of their kind. He wrote operas, oratorios and cantatas, besides compositions for orchestra and pianoforte and set to music Bürger's translation of Macbeth, Goethe's Faust, Egmont and Tasso, besides many lyrics. He edited musical periodicals and, among other works, published ‘Ueber die deutsche Komische Oper’ (1774); ‘Ueber die Pflichten des Ripienviolinisten’ (1776); ‘Schreiben über die Berlinische Musik’ (1775); ‘Vertraute Briefe aus Paris’ (1804–05); ‘Vertraute Briefe geschrieben auf einer Reise nach Wien’ (2 vols., 1810).

**REICHENBACH,** rīk'ʜĕn-bäcʜ, **Karl,** Baron von, German naturalist: b. Stuttgart, 12 Feb. 1788; d. Leipzig, 19 Jan. 1869. He studied at Tübingen, where he obtained the degree of doctor of philosophy, and was denounced to the Napoleonic police and imprisoned for having organized an association with the fanciful object of founding a German kingdom in the South Seas. He visited the principal iron works in France and Germany and established others of his own at Villingen and the first large German charcoal-burning establishment at Hausach in Baden. In 1821 he founded with Count Hugo zu Salm a number of industrial establishments in Moravia, from which he realized a considerable fortune. The king of Würtemberg raised him to the dignity of baron in 1839. In 1834 he published in Vienna ‘Mittheilungen aus Mähren,’ the first geological monograph in Austria. He is also credited with some chemical discoveries, in particular of paraffin and creosote. In the course of his studies of animal magnetism he believed he had discovered a new force, which he called *od* and upon which he published several works, as ‘Odisch-magnetische Briefe’ (1852); ‘Der sensitive Mensch und sein Verhalten zum Ode’ (1854). Od, he said, was a peculiar power possessed by certain persons of special sensitiveness, which enabled them to detect veins of ore, distinguish negative and positive magnetic poles, start a pendulum without touching it and the like. He derived the word from the Latin *vado,* «I go quickly.» Part of the scientific world attacked his theory, but the larger portion laughed it out of court; and after his death it was quite forgotten. Among his other literary productions may be mentioned ‘Geologische Mittheilungen aus Mäleren’ (1834); ‘Das Kreosot’ (1833); ‘Die Dynamide des Neognetismus’ (1840); ‘Odische Erweiderungen’ (1856); ‘Köhlerglaube’ and ‘Afterwissenschaft,’ in reply to Karl Vogt (1856); ‘Aphorismen über Sensibilität und Od’ (1866); ‘Die odische Lohe’ (1867).

**REICHENBACH,** Saxony, 11 miles southwest of and in the circle of Zwickau, 11 miles northeast of Plauen, is a manufacturing town, trading considerably in woolen and cotton goods, and has a notable town hall. This is the home of the distinguished antiquary, Böttiger (q.v.). Pop. (1905) 29,060.

**REICHENBERG,** rīk'ʜĕn-bĕrg, Czecho-Slovakia, town in Bohemia, on the Neisee, about 60 miles in direct line north-northeast of Prague (q.v.). It is a well-built town with several modern public buildings and a number of historic edifices dating back to the 13th and 14th centuries. Its principal church contains an altar-piece by

Dürer. It is one of the leading manufacturing towns of the republic. The chief manufactures are woolen, cotton and linen goods, carpets, leather, shoes, hats, gold and silver ware, musical instruments and firearms. The schools rank high, especially its industrial school. Pop. (1914) 37,100.

**REICHMANN,** rīkʜ'män, **Theodor,** German opera singer: b. Rostock, Mecklenburg, 18 March 1849; d. Vienna, Austria, 22 May 1903. He studied at Berlin, Prague and Milan, and became widely known on the German operatic stage as a dramatic baritone. In 1882 he began his engagement at the Vienna Opera House and in that year created the part of Amfortas in ‹Parsifal› at Baireuth. He continued at the Vienna Opera House with great success until 1889, when he came to New York and made his first appearance at the Metropolitan Opera House in ‹The Flying Dutchman.› He later appeared in ‹Der Trompeter von Salk-Kengen.› His reception there was most flattering, and his success was marked throughout his engagements there in 1889–90, 1890–91. After his New York activities he filled star engagements in London, Saint Petersburg, Moscow and many German cities, and then returned to his former post at Vienna, where he remained till his death. He possessed a remarkable voice; and his dramatic impersonation of his various rôles made him one of the most famous operatic singers of his day. He was notable in his presentation of the rôles William Tell, Telramund, Wolfram, Wotan (in ‹Siegfried›), Hans Sachs, Tilos (in ‹Der Vassal von Szigeth›), Nelusko (in ‹L'Africaine›), etc.

**REICHSBANK, Deutsche,** the official centre of the German banking and monetary system, was inaugurated on 1 Jan. 1876, in accordance with the German Banking Law of 14 March 1875. While established with private means and forming a corporate body, it is under the management and supervision of the empire. Its original capital was 120,000,000 marks, later (7 June 1899) increased to 180,000,000 marks. The purpose of its establishment was the «regulation of the money circulation of the whole Empire, the facilitation of payments, and the utilization of available capital.» The management of the institution is vested in the Imperial Chancellor, and by him delegated to the president of the bank and a board of directors, these latter appointed for life. In addition, supervision over the bank is maintained by a board of curators — the Imperial Chancellor and four members. The shareholders have a voice, principally in an advisory capacity through a general meeting, and ad interim through a central committee consisting of 15 members and 15 alternates who meet at least once a month. From this central committee three members are selected to supervise the management of the bank and participate, with advisory powers only, in the meetings of the board of directors. In matters of an unusual nature with the empire or with the German federated states the consent of a majority of the central committee is required. Upward of 500 branches of the Reichsbank are distributed throughout the empire, the shareholders of each community having such a branch, forming district committees similar in function to those of central committee, from which district committees three deputies are selected to manage the local offices. The Reichsbank is authorized to issue bank notes, in no case more than thrice its cash reserve — coin, bullion, imperial treasury notes and notes of other note-issuing banks — the excess over the cash reserve to be rendered secure by discounted bills secured by at least two persons of known solvency, said excess being subject to a tax of 5 per cent. These bank notes the Reichsbank is obligated to redeem in German gold coin at its central or branch offices on presentation «in so far as the available cash and money requirements permit.» Such issues (Act of June 1909) are legal tender. In view of this obligation the activities of the institution are confined necessarily to banking transactions involving assets of immediate marketability; transactions in precious metals; discounting of secured bills of three months or less; purchase and sale of imperial government or federated state bonds, and other like short-term securities specified by law; in addition it receives interest- and non-interest-bearing moneys on deposit and «giro» account; such, if interest-bearing, not to exceed the combined capital and surplus funds of the bank. Finally, it is authorized to receive in custody and manage articles of value. It is the Reichsbank that introduced the system (10 April 1876) of «giro» transactions whereby, in lieu of cash payment between «giro» customers of the bank, the corresponding debit and credit is entered in the accounts of the respective parties, facilitating the settlement of claim and counterclaim at the same bank or between the bank and its branches or between any of the latter by simple bookkeeping transfer. This, of course, presupposes such prior arrangement with the depositors, who are then known as «giro» customers. At the present time a majority of the imperial and federated state government treasuries maintain «giro» accounts with the Reichsbank — a facility employed also by most of the great German corporations, particularly since 1 Jan. 1909, by the introduction of a postal and cheque transfer system to which the Reichsbank is a party. The practical operation of the system is that of an immense clearing-house acting through a single institution. Since its inception the «giro» system has met with every demand of German finance and transactions through it have grown more than twenty-fold.

The condition of the Reichsbank is indicated from the following figures taken from the report for 23 April 1917 (in round numbers): Cash reserve, 3,108,220,000 marks, comprising coin and bullion, to the amount of 2,549,000,000 marks, and treasury and loan bank notes to the amount of 550,420,000 marks; other bank notes, 8,800,000 marks; bills discounted, 8,484,800,000 marks; advances, 9,280,000 marks; investments, 105,160,000 marks; other securities, 1,088,000,000 marks; notes in circulation, 8,144,920,000 marks; deposits, 4,014,320,000 marks; other liabilities, 366,240,000 marks; and reserve fund, 83,460,000 marks. The note issue in circulation on this particular date was 8,144,920,000 marks, or 5,036,700,000 marks in excess of the cash reserve. This excess was secured primarily by discounted bills amounting to 8,484,800,000 marks, in addition to the other bank assets amounting to 1,218,984,000 marks, a total of 9,703,784,000 marks, which, minus liabilities of

4,380,570,000, leaves net a balance of 5,323,214,000 marks. The note circulation based upon bills discounted constitutes what is denominated the «elastic» part of the whole note issue, in that it is closely adapted to the varying state of the market, based, as it is, upon the actual evidences of everyday business. What profit undue inflation would give to the bank and its stockholders is counterbalanced by the 5 per cent tax on same that the government receives — a charge that maintains the excess note issue to the actual needs of business.

During its first 35 years of existence (1876–1911) the Reichsbank's net profits amounted in round figures to 691,000,000 marks; during the same period the Imperial Treasury received 325,500,000 marks and the stockholders 336,400,000 marks of these net profits, this being for the latter an annual average of 6.92 per cent. Consult Reisser, J., 'Die deutsche Grossbanken und ihre Konzentration' (1909); 'Germany's Economic Forces' (1913); 'Report on Co-operation in American Export Trade' (Washington 1916).

**REICHSRATH**, rīkhs'rät, the representative council of the former empire of Austria. It consisted of an Upper House (Herrenhaus), formed of the princes of the imperial family, certain hereditary nobles, archbishops and bishops of princely title, and life-members nominated by the emperor for distinguished service in art, science, the Church and State; and a Lower House (Abgeorduetenhaus), elected on the basis of universal, equal and direct suffrage, under the Electoral Law of 26 Jan. 1907. All Austrian male citizens over 24 years of age who had resided for at least a year in the place of election were entitled to vote for deputies. In 1917 the Upper House contained 237 members and the Lower House 516, the latter elected for six years. For the new chamber, see AUSTRIA.

**REICHSTADT**, rīkh'stät, **Duke of** (NAPOLEON FRANÇOIS CHARLES JOSEPH BONAPARTE), titular emperor of France: b. Paris, 20 March 1811; d. Schönbrunn, Austria, 22 July 1832. He was son of Emperor Napoleon I (q.v.), and from his birth was styled «king of Rome.» In 1814 Napoleon abdicated in favor of his son, but the Senate took no notice of the youth and called Louis XVIII to the throne, whereupon Maria Louisa and the boy removed to the palace of Schönbrunn, near Vienna. After Waterloo Napoleon proclaimed his son Napoleon II (22 June 1815). He was brought up at the court of his grandfather, the Emperor Francis, who created him Duke of Reichstadt (1818). His education was careful, and he was early trained to the military profession. At the July Revolution in 1830 his name was mentioned as a candidate for the French throne, and Talleyrand is said to have made an unsuccessful effort in his behalf. After passing through subordinate grades he was made a lieutenant-colonel in June 1831, and took command of a battalion in the Gyulai regiment of Hungarian infantry, then garrisoned at Vienna. He was extremely attentive to his military duties, but he had grown very tall and slender and symptoms of consumption had early shown themselves. His physician advised a removal to Schönbrunn, but this proved unavailing. His last words, addressed to his mother, were «Ich gehe unter, meine Mutter, meine Mutter.» The Duke was made the hero of 'L'Aiglon' ('The Eaglet'), a drama by Edmond Rostand (q.v.). Upon the accession of Napoleon III (q.v.) he was reckoned among French sovereigns as Napoleon II. Consult Welschinger, 'Le Roi de Rome' (1879); Lacroix, 'Le Roi de Rome' (1899); Wertheimer, 'Der Herzog von Rom' (1902).

**REICHSTAG**, rīkhs'täg, the representative legislative body of the German nation as a whole. The Reichesrath is of the separate German states. The president of the Reichstag is elected by the deputies. In 1917 the Reichstag was composed of 397 members, elected by universal suffrage and ballot for the term of five years. See GERMANY.

**REICK**, rīk, **William Charles**, American journalist and publisher: b. Philadelphia, Pa., 29 Sept. 1864. He was educated at Harvard, and engaged in newspaper work at Philadelphia in 1883. In 1888–89 he edited the London and Paris editions of the New York *Herald* and in 1889–1903 he was city editor of that publication. He was president of the New York Herald Company in 1903–06, and of the Public Ledger Company of Philadelphia in 1907–12. He was one of the principal owners of the New York *Times* in 1907–12, and chief owner of the New York *Sun* in 1911–17.

**REID**, rēd, **Alexander Peter**, Canadian physician: b. London, Ontario, 22 Oct. 1836. He was educated at the universities of McGill, Edinburgh and New York. He practised for a time in Ontario, but in 1860 went to the Northwest Territory; returning in 1864 he engaged in practice in Nova Scotia, chiefly at Halifax. He was instrumental in founding the Halifax Medical College and held several chairs there, also serving as president for several years. He was for 16 years visiting physician at the City Hospital, superintendent of the Hospital for Insane for 15 years and later served at the Victoria General Hospital. He was deeply interested in securing legislation governing the study and practice of medicine in Nova Scotia; was secretary of the Provincial Board of Health in 1893–1904, and afterward was chief health officer for Nova Scotia. He was subsequently retired on a pension.

**REID, Daniel Gray**, American financier: b. Richmond, Ind., 1 Aug. 1858. He was educated in the public schools, entered the Second National Bank of Richmond as a clerk in 1874 and worked his way up to its vice-presidency in 1895. He became interested in the tin-plate industry at Elwood, Ind., in 1892; and in 1895 he was one of the organizers of the American tin-plate industry, of which he was elected president. He removed to Chicago in 1897 and to New York in 1899. He assisted in the organization of the National Steel Company, the American Steel Hoop Company and the American Sheet Steel Company; and on the organization of the United States Steel Corporation in 1901 he became a director and member of the executive committee. He was also interested in railroad organizations and many banks and trust companies.

**REID**, SIR **George**, Scottish artist: b. Aberdeen, Scotland, 31 Oct. 1841; d. 9 Feb. 1913. He studied art in Edinburgh, Utrecht, Paris and The Hague, being the pupil in turn of Mollinger, Israels and Yvon. In 1891 he was elected president, in succession to Douglas, of the Royal Scottish Academy and knighted. He was widely known for his fine portraits and was also distinguished as a flower and landscape painter and as a book illustrator of high merit.

**REID, George Agnew,** Canadian painter: b. near Wingham, Ontario, 1860. At Paris he was a pupil of Constant, Lefebvre and Dagnan-Bouveret and became a constant exhibitor at the Salon. The World's Fair Columbian medal was awarded to his ‘The Foreclosure of the Mortgage’ (1893). He excels in figure painting and has been successful in panel decoration and the series in the entrance hall of the Municipal Buildings, Toronto, contain very good examples of his style. In 1898 he was president of the Ontario Society of Artists.

**REID, Harry Fielding,** American geologist: b. Baltimore, Md., 18 May 1859. He was educated at the Pennsylvania Military Academy and at the Johns Hopkins University, later studying in England and Germany in 1884–86. He was connected with the faculty of the Case School of Applied Science, Cleveland, in 1886–94; with the University of Chicago in 1895–96; and in 1896 went to Johns Hopkins, where he has been professor of dynamical geology and geography since 1911. He has been special expert in charge of the earthquake section of the United States Geological Survey since 1902 and in 1917 he was one of the National Research Council sent to Europe by the government to study scientific developments in connection with the European War. Author of ‘Parts VI–VIII, Highways of Maryland’ (1899); and joint author of ‘Second Report on Highways of Maryland’ (1902); ‘Report of California State Earthquake Investigation Committee, Vol. II’ (1910).

**REID (Thomas), Mayne,** British author of tales of adventure: b. Ballyroney, County Down, Ireland, 4 April 1818; d. near Ross, Herefordshire, England, 22 Oct. 1883. The son of a Presbyterian minister, he was educated for the ministry, but love of adventure took him to this country, where he engaged in various callings and traveled widely as hunter and trader. In 1843 he was a journalist in Philadelphia, but joined the United States army as a volunteer in 1846 and fought in the Mexican War, his experiences in which furnished him with materials utilized in several novels. He afterward went to London and became well known as a writer of thrilling stories, many of them based on his American experiences, such as ‘The Rifle Rangers’; ‘Scalp Hunters’; ‘The War Trail’; ‘The Headless Horseman,’ etc. He returned to America in 1867 and founded the *Onward Magazine,* which was unsuccessful, and in 1870 went back to England. Many of his tales were translated into French and German. They were all very readable and healthy in tone, though extravagant in incident. Consult ‘Memoir’ by his wife (1890).

**REID, Ogden Mills,** American editor and publisher, son of Whitelaw Reid (q.v.) and grandson of Darius Ogden Mills (q.v.): b. New York, 16 May 1882. He was educated at the University of Bonn, Germany, and at Yale, and was admitted to the bar of New York State in 1908. He then began work as a reporter on the New York *Tribune,* occupying different positions in his progress toward managing editorship in 1912 and editorship in 1913. He succeeded his father not only as editor but as principal owner of the *Tribune* and is president of the Tribune Association. His policy in conducting the newspaper has been marked by much vigor and straightforwardness and the gathering of an able staff.

**REID, Robert,** American painter: b. Stockbridge, Mass., 29 July 1862. His work shows the influence of Impressionalism, but as the pupil of Boulanger and Lefebvre in Paris, where he began his art studies, he maintains an academic correctness and insistence upon detail which render his work singularly effective. His great decorative piece in the Paris Exposition of 1900 (‘America Unveiling Her Natural Strength’) was much admired and like all his productions in this department has extended his reputation. The Library of Congress; Massachusetts State House, Boston; Appellate Court House, New York; Paulist Fathers' Church, New York; and many private buildings contain mural decorations by him.

**REID, Sir Robert Gillespie,** a Newfoundland railway contractor: b. Coupar-Angus, Scotland, about 1842; d. Montreal, Canada, 3 June 1908. In 1865 he went to Australia, where he took part in gold-mining and public works; in 1871 came to America and constructed many railways in the United States and Canada. The heaviest section of the Canadian Pacific was built by him; and he was prominent also in bridge-work, constructing the international railway bridge over the Rio Grande, the international bridge across the Niagara and (1886) the Lachine bridge over the Saint Lawrence. In 1893 he made a contract with the colony of Newfoundland whereby he was to build a railway from Saint John's to Port-au-Basque to be completed in three years at $15,600 per mile. For the further consideration of a land-grant of 5,000 acres per mile of construction, he was to maintain and operate the railway for 10 years. He contracted with the colonial government in 1898 to operate all the railways of the island for 50 years, maintaining them in a safe and efficient manner, on condition that the railways should become his property at the end of that period. He was to obtain also 4,500,000 acres of land concessions additional and the government land telegraph lines. On his part he contracted also to build and operate seven steamers transporting passengers and goods at various points in the island; to buy and operate the Saint John's dry-dock; to build and operate an electric street railway in Saint John's; to pave a specified portion of Saint John's; and to pay $1,000,000 within one year from the date of the signing of the contract. In fact, he became the real owner of the island and was popularly known as «Tsar» Reid. Sir Robert Bond, the Liberal leader, protested against the contract; a material revision of the contract was made favorable to the colony and the property transferred to the Reid-Newfoundland Company. He was knighted in 1907.

**REID, Samuel Chester,** American naval officer: b. Norwich, Conn., 25 Aug. 1783; d. New York, 28 Jan. 1861. He entered the United States navy as a midshipman when very young, rose rapidly in rank and in the War of

1812 commanded the privateer *General Armstrong.* He repulsed the British attack in the harbor of Fayal, Azore Islands, 26 Sept. 1814, the enemy having three heavily armed vessels with 2,000 men to his single vessel with 90 men and seven guns. During 10 hours' fighting, the British lost 300 killed and wounded and the Americans two killed and seven wounded. The British government subsequently apologized for the attack on an American vessel in a neutral port, and the engagement is considered important in having prevented British ships from attacking New Orleans and so enabling Jackson to reach that city in time to save it. Reid was subsequently harbormaster and warden of the port of New York. He invented a signal telegraph, reorganized the pilot-boat system, established a lightship off Sandy Hook and designed the present flag of the United States, first used in 1818, suggesting the retention of the original 13 stripes and the addition of a star for each new State.

**REID, Thomas,** Scottish metaphysician: b. Strachan, Kincardineshire, 26 April 1710; d. Glasgow, 7 Oct. 1796. He was graduated at Marischal College, Aberdeen, in 1726, and in 1736 presented to the neighboring living of New Machar. It was his custom to preach the sermons of Tillotson and Evans rather than his own compositions, for he was already chiefly absorbed in the study of metaphysics. In 1748 he published a paper in the London ‹Philosophical Transactions,› in which he opposed the introduction of mathematical formulas into metaphysical and moral speculations, and particularly criticized the statement of Hutcheson that the benevolence or moral merit of an agent is «proportional to a fraction having the moment of good for the numerator, and the ability of the agent for the denominator.» He was in 1752 elected professor of philosophy in King's College, his department comprehending logic, ethics, mathematics and physics. His ‹Inquiry into the Human Mind on the Principles of Common Sense› (1764) aimed at the refutation of Hume skeptical theory. Affirming the impossibility of proving the existence of an external world from reason, or experience, or instruction, or habit, or any other principle hitherto known to philosophers, Reid introduced the doctrine of an original instinct or «common sense» (q.v.) as the ground of the belief. In 1764 he was transferred to the University of Glasgow as successor to Adam Smith in the chair of moral philosophy. His course included metaphysics, moral philosophy, natural law and political right. He was a member of a philosophical society before which he read several essays, including an ‹Examination of Dr. Priestley's Opinion Concerning Matter and Mind,› ‹Observations on the Utopia of Sir Thomas More› and ‹Physiological Reflections on Muscular Motion.› In 1781 he withdrew from public duties to devote himself exclusively to philosophical studies. In 1785 he published ‹Essays on the Intellectual Powers of Man,› consisting of his academical lectures, and in 1788 his ‹Essays on the Active Powers of Man,› his last important work. An edition of his works with notes and dissertations was prepared by Sir William Hamilton (incomplete, 1846). Consult the ‹Life› by Dugald Stewart (1804); McCosh, ‹Scottish Philosophy from Hutcheson to Hamilton› (1890); Sneath, ‹The Philosophy of Reid› (1892).

**REID, Sir Thomas Wemyss,** English journalist: b. Newcastle-on-Tyne, 29 March 1842; d. London, 26 Feb. 1905. He contributed frequently to English reviews and magazines, edited the Leeds *Mercury* (1870–87) and *The Speaker* from 1890 to 1899, when he resigned. He was knighted in 1904. He was the author of ‹Cabinet Portraits: Sketches of Leading Statesmen of Both Parties› (1872); ‹Charlotte Brontë: A Monograph› (1877); ‹The Land of the Bey› (1882); ‹Mauleverer's Millions› (1885); and ‹Lives› of W. E. Forster (1888), Lord Houghton (1890), Lord Playfair (1899), Gladstone (1899) and William Black (1902). His ‹Memoirs,› edited by his brother, were published in 1905.

**REID, Whitelaw,** American diplomat: b. Xenia, Ohio, 27 Oct. 1837; d. London, England, 15 Dec. 1912. He was graduated from Miami University in 1856; and began his journalistic career as editor of the Xenia *News,* in 1858–59. In 1860 he became a reporter for the Cincinnati *Gazette,* in 1861–62 was war correspondent, and later Washington correspondent for the same paper, the brilliancy and accuracy of his war reports attracting considerable attention among newspaper men. He was aide-de-camp on the staff of General Morris and General Rosecrans in West Virginia. In 1863–66 he was librarian of the House of Representatives and after the war spent some time on a cotton plantation in Concordia Parish, La. In 1868 he joined the editorial staff of the New York *Tribune;* in 1869 became managing editor and in 1872 editor-in-chief. Under his management the *Tribune* came to rank among the leading papers of the city in the trustworthiness of its news reports. He twice declined an appointment as Minister to Germany, was Minister to France in 1889–92 and negotiated important reciprocity treaties, and in 1892 was the unsuccessful Republican candidate for Vice-President. He was the Special Ambassdor from the United States to Queen Victoria's jubilee in 1897; was a member of the American-Spanish Peace Commission in Paris in 1898; and was Special Ambassador at the coronation of Edward VII in 1902. In April 1905 he was appointed Ambassador to the Court of Saint James, to succeed Joseph H. Choate, and held that post till his death. He had been a regent of the University of New York since 1878. His notable publications include ‹After the War, a Southern Tour› (1867); ‹Ohio in the War› (1868), an important contribution to the local history of the State; ‹Schools of Journalism› (1870); ‹The Scholar in Politics› (1873); ‹Newspaper Tendencies› (1874); ‹Town Hall Suggestions› (1881); ‹Two Speeches at the Queen's Jubilee› (1897); ‹Some Consequences of the Late Treaty of Paris› (1899); ‹Our New Duties› (1899); ‹A Continental Union› (1900); ‹Our New Interests› (1900); and ‹Problems of Expansion› (1900). He wrote the introduction for the centennial edition of Thackeray's ‹Vanity Fair› in 1908 and was one of the speakers at the English celebration of the centenary of Dickens' birth. In English history, his address on Edmund Burke has been pronounced his most important study.

**REID, Sir William,** Scottish meteorologist and colonial governor: b. Kinglassie, Fifeshire, 1791; d. London, 21 Oct. 1858. He was educated at the Royal Academy at Woolwich, and in 1809 entered the army as lieutenant of engineers, serving in the Peninsular campaign under Wellington, in America in the War of 1812 and in Belgium in 1815. He was appointed governor of Bermuda in 1839, and by his excellent administration of affairs greatly improved the deplorable agricultural condition of the island. He opened a market for their products in New York and by these and other efficient methods gained the title of «the good governor.» In 1846 be became governor of the Windward Islands and in 1848 he returned to England and was appointed commanding engineer at Woolwich. In 1851 he was knighted and appointed governor of Malta, where he remained until 1858. He was raised to the rank of major-general in 1856. He became interested in meteorology in 1831 while superintending the repair of injuries inflicted by a severe hurricane at Barbados, and engaged in a correspondence with William C. Redfield (q.v.) of Yale College. The correspondence has since been presented to Yale. His publications include ‘An Attempt to Develop the Law of Storms by Means of Facts Arranged According to Place and Time’ (1838) and ‘The Progress of the Development of the Law of Storms’ (1849).

**REID, William Thomas,** American educator: b. near Jacksonville, Ill., 8 Nov. 1843. He served in the Union army during the Civil War, was graduated from Harvard in 1868 and was headmaster of the high school, Newport, R. I., 1868–71. He subsequently taught in the Boston Latin School, was superintendent of the Brookline, Mass., schools 1873–75, was principal of the San Francisco Boys' High School 1875–81 and president of the University of California 1881–85. He founded the Belmont School for Boys at Belmont, Cal., the most important college preparatory school on the Pacific Coast and was for many years its headmaster. Consult Adams, ‘Some Famous American Schools’ (1903).

**REIDSVILLE,** N. C., city in Rockingham County, 75 miles northeast of Raleigh, on the Southern Railway. It is situated in a tobacco-raising district and has tobacco factories and warehouses as well as a cotton-mill. Pop. 5,333.

**REIGHARD,** rī'gärd, **Jacob Ellsworth,** American zoologist: b. Laporte, Ind., 2 July 1861. He was graduated in 1882 from the University of Michigan; studied also at Freiburg-im-Breisgau, was assistant professor of zoology at the University of Michigan in 1887–88 and 1890–92, and directed the scientific work of the Michigan fish commission in 1890–95. In 1898–1901 he was in charge of the biological survey of the Great Lakes for the United States Fish Commission. From 1895 he held the chair of zoology in the University of Michigan. He wrote ‘The Anatomy of the Cat’ (with H. S. Jennings, 1901) and many papers on fresh-water biology and sub-aquatic photography.

**REIGN OF TERROR,** a period of the French Revolution, conspicuous for its horrors and cruelties. It is generally considered to extend from 21 Jan. 1793, the date of the execution of Louis XVI, to 28 July 1794, when Robespierre and other sanguinary leaders were guillotined. Every day, during the Reign of Terror, victims were hurried, after a mock trial, to the scaffold, and the prisons were kept replenished by fresh captives from all parts of France. When all the nobility who could be reached had been cut off, the middle and lower classes were drawn upon for victims, and the terrorists even laid traps for each other, in their mad ambition and fear of what the future might bring. At last a successful *coup d'état* was secretly organized, which resulted in the extermination of the more rabid revolutionists and the lifting of the awful nightmare which had brooded for months over France. The Reign of Terror had its reaction in the despotism of Napoleon and eventually in the restoration of the Bourbons.

**REIKIAVIK,** rī'kē-ä-vĭk, or **REYKJAVIK,** rīk'yä'vĭk (Dan. Reikevig), Iceland, capital of the island, stands on the southwestern coast and is an important northern port from which considerable trade is carried on. It is the seat of a local legislature and, under the constitutional law of 1903, of a minister appointed by the Danish king. It is also the seat of a bishop. The climate is not very severe as generally supposed. The people are unusually intelligent; the chief institutions include a public library, college, gymnasium, observatory, churches and medical, divinity and nautical schools. A noteworthy attraction is a statue of Thorwaldsen. A great fair is held annually

**REIMARUS,** rī-mä'roos, **Hermann Samuel,** German scholar: b. Hamburg, 22 Dec. 1694; d. there, 1 March 1768. Early in life he devoted himself to the study of languages, and he became distinguished for his knowledge of Latin, Greek and Hebrew. From about 1714 he studied at Jena and afterward lectured at Wittenberg. He became in 1723 rector at Wismar and in 1728 was appointed to the professorship of Hebrew in the Gymnasium of Hamburg, which he subsequently united with the professorship of mathematics. He edited the works and wrote the life of his father-in-law, ‘De Vita et Scriptis J. Alb. Fabrici Commentarius’ (1737). The edition of Dio Cassius, begun by Fabricius and ended by him, shows him as a philologist in a favorable light. Among his further publications are ‘Die vornehmsten Wahrheiten der natürlichen Religion’ (1754); ‘Betrachtungen über die Kunsttriebe der Thiere’ (1762), and ‘Vernunftlehre’ (1756). In the ‘Wolfenbüttelsche Fragmenten eines Ungenannten’ (published by Lessing in 1777–78) he made an application of the rules laid down in the last-mentioned work against the positive doctrines of Christianity. Until published by Lessing it was known only in manuscript to a few of his most intimate friends. It precipitated the well-known controversy between Lessing and Pastor Goeze of Hamburg. Toward the end of his life Reimarus applied his hours of leisure to the study of natural history, of which he acquired an extensive knowledge and led to his ‘Observations, Physical and Moral, on the Instinct of Animals’ (2 vols., 1760. See Lessing.

**REIMS,** rēmz. See Rheims.

**REINACH**, rā-näk, **Joseph**, French publicist and politician: b. Paris, 30 Sept. 1856; d. Paris, 18 April 1921. He was admitted to the bar in 1877, in 1881 became secretary to Gambetta and continued such until the fall of that minister. Having earlier devoted considerable time to journalism, he returned to that field in 1886, becoming proprietor with Denayrouse of *La Republique Française.* In 1889 he was elected deputy by the arrondissement of Digne and was re-elected in 1893, but owing to his attitude of criticism of the Dreyfus trial and his demand for a revision, he failed of re-election in 1898. He published a number of pamphlets on this celebrated case. He is also the author of ‹La Servie et la Montenégro› (1876) ; ‹Voyage en Orient› (1879) ; ‹Le Ministère Gambetta, Histoire et Doctrine› (1884) ; ‹Etudes de Litérature et d'Histoire› (1888–89) ; ‹La Politique Opportuniste› (1890) ; ‹Petites Catilinaires› (1888–89), being his articles against Boulangism published in *Republique Française.* He edited ‹Discours et Plaidoyers politiques de Gambetta› (1881–85) and ‹Dépéches Circulaires Decrets, Proclamations et Discours de Gambetta› (1870–71).

**REINACH, Salomon,** French archæologist, brother of Joseph Reinach (q.v.) : b. Saint-Germain-en-Laye, 21 April 1858. He was educated at the Lycé Fontanes and the École Normale Supérieure and was appointed to the École Française d'Athènes. He made a series of excavations and investigations at Myrina near Smyrna in 1880–82, was secretary of the Archæological Commission of Tunis in 1882–85 and in 1886 was an attaché at the Museum of National Antiquities at Saint-Germain-en-Laye. In 1890–92 he was assistant professor of archæology at the Ecole du Louvre, was associate curator of the National Museums in 1893, in 1896 was elected to the Académie des Inscriptions et Belles-Lettres and in 1906 became president of that institution. He has published ‹Chronique d'Orient› (1885–91) ; ‹Description raisonné dus Musée de Saint-Germain› (1890) ; ‹Répertoire de la Statuaire grecque et romaine› (1897–98) ; ‹Guide illustré du Musée national de Saint-Germain› (1899), etc. A bibliography of his works, embracing more than 50 volumes and about 2,000 articles, has been printed, last edition 1907. His most popular works are a general history of art and a general history of religion.

**REINBOLD,** rīn'bōlt, **Adelheid.** See BERTHOLD, FRANZ.

**REINDEER,** a very distinct genus *Rangifer,* of *Cervidæ,* unique in the possession of antlers by both sexes, though those of the female are somewhat smaller. The Euro-Asiatic reindeer (*Rangifer tarandus*) is the only domesticated species of the family. It extends over the boreal regions of the Eastern hemisphere between about lat. 50° and 81°, and runs into several well-marked varieties. The reindeer formerly had a much wider geographical range and is probably the *bos cervi figura* described by Cæsar as inhabiting the Hercynian forests. Its remains are found associated with hippopotami in Pleistocene formations still farther south in Europe. The antlers are not alike on both sides, the great palmated brow tine being, as a rule, developed on one side only. In the winter the fur is long, grayish brown on the body; neck, hind-quarters and belly white. In summer the gray hair darkens into a sooty brown and the white parts become gray, owing to the shedding of the long hairs. To the Laplander the reindeer serves as a substitute for the horse, the cow, the sheep and the goat. It is extensively employed as a beast of draft and carriage, being broken to draw sledges or to carry men or packages on its back; the large race of Siberia and Kamchatka being used especially for the latter purpose. A full-grown animal can draw a weight of 300 pounds and travel at the rate of 100 miles a day, its broad deeply cleft hoofs fitting it admirably for traveling over the broken snow. In winter the herds feed in the woods on the lichens which hang from the trees or grow upon the ground, to secure which the shovel-like brow tine and the hoofs are employed to scrape away the snow; in summer they move to the valleys to feed on the herbage and shoots, and in autumn they seek the sea coast in order to escape the mosquitoes and gad-flies, where they feed largely upon marine algæ cast upon the shore. So important are these animals to the Laplanders that they, with their entire households, accompany them on these annual migrations. In 1891 16 head of domestic reindeer were introduced into Alaska by Dr. Sheldon Jackson for the benefit of the natives who frequently suffered for food and for purposes of transportation. The experiment proved so satisfactory that importations were continued for 10 years, at the end of which time 1,200 had been brought from Siberia. In 1898 Dr. Jackson, as agent of the United States government, procured a colony of Laplanders to train the natives in the care of the reindeer. On 30 June 1915 there was officially reported a total of 70,243 reindeers in the Territory, distributed among 76 herds. Of the total 46,683 were owned by natives; 3,408 by the United States government; 6,890 by the various missions, and 13,262 by Laplanders and other whites. The valuation of the reindeers owned by natives was $1,167,075; of those owned by all others, $589,000; the total income of natives from their holdings, 1895–1915, was $369,407, of all others, $107,361; making the total valuation and income $2,232,843, and the total government appropriation for the industry in 1893–1915 was $307,000; total gain, $1,925,843.

By European mammalogists the American wild reindeer or caribou, as they are called, are considered to be co-specific with *R. tarandus,* but American students recognize two native species with some six or seven sub-species. The woodland caribou (*R. caribou*) inhabits the wooded parts of British America and the United States border from Maine to Minnesota. It is larger than most varieties of the European reindeer, and both the brow and bez-tines of the antlers are much palmated; those of the female are much smaller and little palmated. It frequents marshy regions and feeds upon leaves, grass and shoots, but in some localities at least, migrates northward in the winter in search of tree lichens (*Usnea,* etc.) and reindeer moss (*Cladonia rangiferina*). The latter is a valuable lichen, which grows in great abundance in the north of Europe, particularly in Lapland, as well as on the tundras of Siberia and the barren plains of Arctic America. It constitutes almost the sole winter food of the reindeer. Linnæus says it grows so luxuriously in Lapland that it sometimes reaches a foot in height. The reindeers scratch it up from under the snow with their feet and antlers. On this plant their existence, as well as that of the Laplanders, to whom they are indispensable, depends. Its nutritive properties depend chiefly on the gelatinous and starchy matter of which it is largely composed. Its taste is slightly pungent and acrid. When boiled it forms a jelly possessing nutritive and tonic properties.

The Barren Ground caribou (*R. arcticus*) is a smaller species with larger antlers which occupies the more central and northern barren plains of British America. This species lives in herds of enormous size, said to rival even those of the bison of former days and migrates regularly. In the winter it moves southward to the wooded belt where it meets but does not mix with the woodland caribou, and in the spring returns to the shores of the Arctic Ocean. See CARIBOU.

Much interesting information concerning the habits of reindeer will be found in the narratives of Nordenskjöld and other Arctic travelers. Besides these consult Caton, ‹Antelope and Deer of North America› (Boston 1881); Lydekker, ‹Deer of All Lands› (London 1898); Richardson, ‹Fauna Boreali-Americana› (London 1829); Jackson, ‹Annual Reports on Reindeer in Alaska› (Bureau of Education, Washington 1892), and annual reports of the Secretary of the Interior and the governor of Alaska.

**REINDEER MOSS.** See REINDEER.

**REINECKE**, rī'nĕk-ė, **Karl**, German musician: b. Altona, Pressia, 23 June 1824; d. —, March 1910. He was educated by his father, a composer, and in 1834 made a successful concert tour as a pianist, later becoming court pianist to the king of Denmark. He was appointed a teacher in the Cologne Conservatory in 1851 and in 1860 was made professor of piano and composition in the Leipzig. Consevatory. He became well known as a director and as a pianist and for his interpretations of Mozart. His compositions number nearly 200, are characterized by great refinement and have a distinctly classical and occasionally a romantic touch. They include ‹Serenade›; ‹Aus der Jugendzeit›; ‹König Manfred› (1867); ‹Auf hohen Befehl› (1886); ‹Der Gouverneur von Tours› (1891), etc.

**REINHART**, rīn'härt, **Benjamin Franklin**, American artist: b. Waynesburg, Pa., 29 Aug. 1829; d. Philadelphia, 3 May 1885. At 15 he began to study art, and afterward took a three years' course at the National Academy, New York. In 1850 he went to Europe and studied in Paris and Düsseldorf. Returning to this country, he settled in New York in 1868. His most important works are engravings, and include ‹Cleopatra› (1865); ‹Washington Receiving the News of Arnold's Treason›; ‹After the Crucifixion› (1875); ‹Evangeline› and ‹Pocahontas› (1877); ‹The Pride of the Village›; and ‹Captain Kidd and the Governor› and ‹Baby Mine› (1884); ‹The ‹Nymphs of the Wood›; ‹Katrina Van Tassel›; ‹Young Franklin and Sir William Keith›; ‹The Regatta›; ‹Consolation,› etc. To these should be added portraits of the Princess of Wales, Duchess of Newcastle, Carlyle, Tennyson, Charles O'Conor, James Buchanan, General Winfield Scott, Stephen A. Douglas and others.

**REINHART, Charles Stanley**, American artist, nephew of Benjamin Franklin Reinhart: b. Pittsburgh, 16 May 1844; d. Philadelphia, 30 Aug. 1896. He went to Paris in 1868 and studied at the Atelier Suisse; later entered the Royal Academy in Munich; and in 1870 returned to the United States. Besides noteworthy illustrations for magazines in this country and in Europe, he produced works in black-and-white, water-color and oil, many of which were exhibited at the National Academy. In 1881 he again went to Paris where he resided till 1891, and was a regular exhibitor at the Salon. Later he became a member of the Society of American Artists, New York, and was identified for several years with the publishing house of Harper and Brothers. Among his works in black-and-white are ‹An American Abroad,› ‹A Little Swiss Sojourn› and ‹Reichstag Sketches›; in water-color, ‹Gathering Wood› (1877); ‹At the Ferry› (1878), and ‹The Spanish Barber› (1884); in oil, ‹The Old Life-Boat› (1880); ‹Washed Ashore› (1887); and ‹The Rising Tide› (1888). He also produced a series of Civil War scenes, several of which were published in *Harper's Weekly* in double-page form. Among his earlier paintings should be noted ‹Clearing Up› (1875); ‹Reconnoitering› (1876), and ‹Refeuse› (1877).

**REINHART, Johann Christian**, German painter: b. near Hof, 24 Jan. 1761; d. Rome, 8 June 1847. He began his professional education as a divinity student in Leipzig theological school, but soon showed a very decided inclination for art and became a pupil of Oeser. He afterward attended the Academy of Dresden. The liberality of his patron, the Margrave of Baireuth, enabled him to visit Rome, where he fixed his residence. His compositions are rich, nobly conceived and full of poetic beauties, but his coloring is wanting in softness and warmth. Of the great masters he most strongly resembles Swanevelt. Among the most excellent paintings of his later years are those in the Massini Palace at Rome. He was also successful as an etcher. Consult Baisch, ‹J. Ch. Reinhart und seine Kreise› (1882).

**REINHOLD**, rīn'hōlt, **Karl Leonard**, German philosopher: b. Vienna, 26 Oct. 1758; d. Kiel, 10 April 1823. His parents destined him for the church, and sent him to study with the Jesuits in Vienna. When the order was abolished in 1774 he entered the college of the regular priests of Saint Paul (generally called Barnabites), where he became, at 22, professor of philosophy. He left Austria in 1787, and the same year was appointed professor at Jena, having written a celebrated vindication of the Reformation against two chapters in Schmidt's ‹History of the Germans.› In 1794 he became professor at Kiel and remained there until his death. Among his other works are ‹Über das Fundament des philosophischen Wissens› (1791); ‹Grundlegung einer Synonymik für den allgemeinen Sprachgebrauch in den philosophischen Wissenschaften› (1812). In his philosophy he followed Kant, Fichte, Bardili and Jacobi. Consult ‹Life› by his son E. Reinhold (1828); Fischer, Kuno, ‹Die neuere Philosophie seit Kant›; ‹Nouvelle Biographie Générale.›

**REINICK,** rī'nĭk, **Robert,** German artist and poet: b. Dantzic, Prussia, 22 Feb. 1805; d. Dresden, 7 Feb. 1852. He studied painting in Berlin under Begas, and at the Düsseldorf Academy, and in 1844 settled at Dresden. He displayed superior artistic powers in romantic and historical subjects, and especially in such works as show the artistic union of brush and pen. Among his more important productions in art are ‹Rachel and Jacob at the Well›; ‹Well Near Olevano,› and numerous etchings contributed to various publications. To Rethel's ‹Dance of Death› he furnished the poetical text and his other writings include ‹Song-book for Artists› (1833); ‹Song-book of a Painter› (1837–44); ‹Songs and Fables for the Young› (1844); Hebel's ‹Allemanic Poems› (1851), which he translated into High German; ‹Collected Songs› (1852); and ‹Book of Poetic Fables and Stories› (1873).

**REINICKE,** rī'nĭk-ė, **Paul René,** German painter and designer: b. Strenz-Naundorf, near Halle, 1860. Beginning his professional life at Weimar in the studio of A. Struys, he afterward became a pupil of E. von Gebhardt at Düsseldorf. In order to extend still further his art experience he went to Palestine as a pupil and assistant of Piglhein, at that time painting his panorama of the ‹Crucifixion of Christ,› and executed a considerable portion of that work. While his promise as a painter was very evident he abandoned the easel on returning to Munich and became chief illustrator for the ‹Fliegende Blätter.› The wonderful skill he has shown in this department of art is well known and he has depicted aristocratic life in park and promenade, ballroom and theatre, with a truthfulness and grace, with a suggestive wealth of detail and consummate finish of execution which are unrivaled. A collection of his designs, under the title ‹Spiegelbilder aus dem Leben› (Reflections from Life› has appeared in heliogravure (1890).

**REINKENS,** rīn'kĕns, **Joseph Hubert,** German Old Catholic bishop: b. Burtscheid, near Aix-la-Chapelle, Germany, 1 March 1821; d. Bonn, 5 Jan. 1896. He was educated at Bonn and Munich, was ordained to the Roman Catholic priesthood in 1847, became a preacher in the cathedral, extraordinary professor (1853), ordinary professor of church history (1857), and rector of the University of Breslau (1865). In 1870 he joined Döllinger in the Old Catholic movement, protested against the infallibility dogma, was suspended from his clerical offices and in 1872 was excommunicated. He became one of the leaders of the Old Catholic movement and in 1873 was consecrated bishop of the Old Catholic Church with his official residence at Bonn, and was recognized as such by the German government. He published ‹Papst und Papstthum nach der Zeichnung des Heiligen Bernhard von Clairvaux›; ‹Hilarius von Poitiers› (1864); ‹Ueber papstliche Unfahlbarseit› (1870), which his bishop attempted to suppress; ‹Die päpstlichen Decrete vom 18 Juli 1870› (1871); ‹Revolution und Kirche› (1876); ‹Lessing über Toleranz› (1883), etc.

**REINSCH,** rīnch, **Paul Samuel,** American diplomat: b. Milwaukee, Wis., 10 June, 1869; d. Shanghai, China, 24 Jan. 1923. He was graduated from the University of Wisconsin in 1892, from its law department in 1894, and after studying abroad was assistant professor of political science at the University of Wisconsin in 1899–1901, full professor in 1901–13, and in the latter year was appointed United States Minister to China. He is the author of ‹The Common Law in the Early American Colonies› (1899); ‹World Politics at the End of the 19th Century as Influenced by the Oriental Situation› (1900); ‹Colonial Government› (1902); ‹Colonial Administration› (1905); ‹American Legislatures and Legislative Methods› (1907); Intellectual Currents in the Far East› and ‹International Unions› (1911), etc.

**REIS EFFENDI.** See EFFENDI.

**REISEBILDER,** rī'zĕ-bĭl'dėr. The ‹Pictures of Travel› belong to the first period of Heine's literary career and made him famous as a writer of prose. The first volume (1826) and the second (1827) are partly in prose and partly in verse, while the third (1830) and fourth (1831) contain prose only. Heine incorporated the poems which occur in the ‹Pictures of Travel› (Vol. I, ‹The Return Home,› ‹From the Journey to the Harz› and the first section of ‹The Northsea›; Vol. II, the second section of ‹The Northsea›) into the ‹Book of Songs.› The ‹Letters from Berlin› (prose) which appeared in the first edition of the ‹Pictures of Travel› (Vol. II) were omitted in subsequent editions. Heine drew directly on his personal experiences for all the ‹Pictures of Travel,› and at times his genius lights up his subjects with the brilliance of lightning, at times we feel more as a passing breath of wind the spirit and the atmosphere of times and places. On the other hand, the author's own personality, his political views and various accessory circumstances of his travels stand out altogether too prominently to permit of comprehensive and objective visions of the regions he visited. Heine never confines himself to his subject, but speaks — as he himself said — «of everything and a few things besides,» mingling with perfect ease the brilliant and the disgusting, the touching and the malicious, the humorous and the sentimental, the grand and the trivial. Irony and love of liberty are two qualities which especially manifest themselves. Among the features and topics which mark the various parts of the ‹Pictures of Travel› apart from the poems are: the charm of the mountains and the simplicity of their inhabitants (‹The Journey to the Harz› in Vol. I); Norderney as a lonely island given up to tradition and as a modern summer resort (‹The Northsea,› section 3 in Vol. II); Heine's boyhood days and his admiration for Napoleon I (‹Ideas. The Book Le Grand,› in Vol. II); German and Italian cities, ancient Rome and modern Italy (‹Journey from Munich to Genoa› in Vol. III); characters drawn in a cynical and satirical vein, polemics against the poet Platen (‹The Baths of Lucca› in Vol. III); celebration of a Catholic holiday in an old Italian city, religious controversies (‹The City of Lucca› in Vol. IV); London, political life in England (‹English Fragments› in Vol. IV). Consult Elster, E., ‹Heinrich Heines Sämtliche Werke› (Leipzig 1890, Vol. III and Vol. I, pp. 35–89, text and introductions); Strodtmann, A., ‹Heinrich

Heines Leben und Werke› (3 Aufl., Berlin 1884); Bölsche, W., ‹Heinrich Heine, Versuch einer ästhetisch-kritischen Analyse seiner Werke› (Leipzig 1888); English translation: ‹The Works of Heinrich Heine,› tr. by C. G. Leland (Vols. II, III); selections (in ‹German Classics,› Vol. VI).

EWALD EISERHARDT.

**REISKE**, rīs'kė, **Johann Jakob**, German philologist: b. Zörbig, Saxony, 25 Dec. 1716; d. Leipzig, 14 Aug. 1774. He was educated at the University of Leipzig and devoted much attention to the study of the Semitic languages, particularly Arabic. Although abjectly poor he journeyed to Leyden, where he gained access to the library and continued his study of Arabic. In 1758 he was appointed to a rectorship at the Nikolai Gymnasium at Leipzig, a position he occupied until his death, devoting himself to Greek literature in regard to which he became an authority. His works display a wide erudition and he succeeded in attracting public attention to the value of Arabic literature in the world of learning. He edited ‹Constantius Porphyrogennetus› (1751–54); ‹Ciceronis Tusculanæ Quæstiones› (1759); ‹Theocritus› (1765–66); ‹Maximus Tyrius› and ‹Oratores Græci› (1774–75); ‹Dionysius Zalicaruasseuris› (6 vols., 1774–77); ‹Plutarchi Opera Omnia› (12 vols., 1774–82), etc.; translated from the Arabic and Greek classics and made the Latin translation of Abulfeda's ‹Annales Moslemici› (1754). Most important among his writings are ‹Miscellaneæ aliquot Observationes Medicæ ex arabum Monimentis› (1746), and ‹Animadversiones in Græcos Auctores› (6 vols., 1757–66). Consult ‹Autobiography,› edited and completed by his wife (1783): Morus, ‹Vita Reiskii› (1777); Haupt, ‹Opuscula› (1875–76).

**REISNER, George Andrew**, American Egyptologist: b. Indianapolis, Ind., 5 Nov. 1867. He was graduated at Harvard in 1889, afterward pursuing graduate courses in Semitic languages there. He was assistant in the department of Egyptology at the Royal Museum, Berlin, in 1895–96, and instructor at Harvard in 1896–97. In 1897–99 he was a member of the international committee on catalogues at the Khedivial Institute, Cairo, and in 1905 became connected with the faculty at Harvard, where he has been professor of Egyptology since 1914. He was appointed curator of the Egyptian department of the Boston Museum of Fine Arts in 1910. He served as director of the Egyptian expeditions of Harvard and of the Boston Museum of Fine Arts from 1905, and has engaged in explorations and excavations in Nubia, Samaria, Bersheh, Girga-Pyramid, Lower Nubia and Dongola. He was granted leave of absence from Harvard in 1916–17. He has written ‹The Early Dynastic Cemeteries of Nayu-ed-der› (Part I, 1907); ‹First Annual Report, Nubian Archæological Survey› (1910); ‹Models of Ships and Boats› (1913), etc.

**REITBOKS**, or **REEDBUCKS**, a genus (*Cervicapra*) of small South African antelopes, which have horns only on the heads of the males and are never found far from water, affecting particularly marshy valleys and the reedy borders of the larger rivers. They are rather more than four feet in length and nearly three feet high at the shoulder; general color, dull ashy-gray, sometimes tinged with red on upper parts, silvery-gray on under parts. The type is *C. arundineum*. Other species are the rio rhebok, nagor and bohor.

**RÉJANE**, rā-zhän, **Madame**, stage-name of GABRIELLE (RÉJU) POREL, French actress: b. Paris, 6 June 1857; d. there, 15 June 1920. She first appeared in 1875 in ‹Revue des Deux Mondes› at the Vaudeville. She became known for her impersonation in melodramatic parts, particularly in the title-rôle of ‹Madame Sans Gêne› (1893), written for her by Sardou. In 1895 she toured in the United States with much success. One of her later appearances was in ‹La Passerelle.› In 1905 she founded a theatre in Paris bearing her own name.

**REJECTED ADDRESSES**, a famous collection of parodies by the brothers James and Horace Smith, which was issued anonymously in 1812, and met with great success. They were written as a burlesque upon the many prominent and unsuccessful competitors for the reward offered by the management of the Drury Lane for an address to be delivered at the opening of the new theatre. Among the parodies the following are the work of James Smith: ‹The Baby's Début› (Wordsworth); ‹The Hampshire Farmer's Address› (Cobbett); ‹The Rebuilding› (Southey); ‹Play-House Musings› (Coleridge); ‹The Theatre› (Crabbe); the first stanza of ‹Cui Bono› (Lord Byron); the song entitled ‹Drury Lane Hustings›; and ‹The Theatrical Alarm-Bell,› an imitation of the editor of the *Morning Post;* also travesties on ‹Macbeth,› ‹George Barnwell› and ‹The Stranger.› The rest are by Horace Smith. The ‹Rejected Addresses› still hold a high place among the best works of their kind ever written, and their extent and variety exhibit the versatility of the authors. James Smith (1775–1839) and Horace Smith (1780–1849) were voluminous contributors to the periodical literature of the day, largely in humorous imitations and amusing trifles. The elder Charles Mathews said to James: «You are the only man in London who can write what I want, good nonsense.»

**REJUVENATION**, the revival of stream erosion in a region in which the rivers have cut as low as they can. It is usually brought about by uplift.

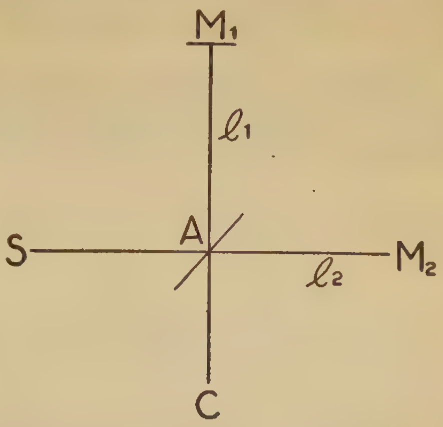
**RELAPSING FEVER**, a disease so called from the fact that during apparent convalescence a relapse of all the symptoms occurs; and this may be repeated more than once. It is also called famine fever, because it has occurred during seasons of destitution since 1739. Other names for it are five-day fever, seven-day fever, mild yellow fever, heart fever and *febris recurrens*. Its present name was given to it by Jenner in 1850. It is infectious and contagious. The symptoms do not usually show themselves for three or four days after exposure to the contagion. They generally begin in a shivering sensation, with headache, and with muscular pains all over the body, but especially in the limbs; then the pulse rises and the temperature increases; there is also great thirst, pain over the stomach and retching. Sometimes there is intense hunger and the patient becomes extremely prostrated. On the fifth or seventh day the symptoms abate and there is rapid amendment until about the 14th or 15th day from the beginning of the symptoms, when a relapse occurs. Three or four days afterward convalescence again begins and in the majority of cases it goes on to complete restoration of health. Relapsing fever is not often fatal, the death rate being about 2 per cent of those attacked. The treatment consists in giving gentle laxatives and cooling drinks, a light nutritious diet and in securing to the patient perfect quietness. Relapsing fever is now known to be caused by a spirillum (*Spirochætæ obermeieri*), a micro-organism which Obermeier of Berlin showed (1873) to be constantly present in the blood of those having this disease.

**RELATIVITY, The Principle of.** The principle of relativity consists essentially in the hypothesis that it is impossible by physical experiment to measure or detect the absolute motion of a body through space. As a consequence the expressions «absolute velocity» and «body at rest» have no significance. Only relative motion can be detected or even defined. If this were all the subject would be of interest to the philosopher rather than the physicist. But it can be shown as a consequence that space and time have no absolute significance. They depend on the motion of the observer. As stated by Minkowski, «From now on, space by itself and time by itself, are mere shadows, and only a kind of blend of the two exists in its own right.»

**Absolute Motion.**— It has been known for a long time that the dynamical properties of a system in uniform motion are identical with those of the same system at rest. A person shut in a box moving with constant velocity could not determine by mechanical means whether he was moving or not. Certain optical experiments, however, suggested that optical methods might determine absolute motion. Thus the index of refraction of a piece of glass is the ratio of the velocity of the incident light to that of the refracted light. Arago, in 1818, suggested that this might be used to determine absolute velocity. The experiment did not succeed. Fresnel explained this by supposing the light to be partially convected, or dragged, by the moving medium. Fizeau tested this notion by sending a beam of light along the direction of motion through water flowing in a tube and found that the velocity of light in the moving water was slightly different from that in water at rest. The experiment, however, only indicated the difference in velocity of the water in two tubes and not the absolute velocity.

The most famous experiment for detecting absolute motion was devised by A. A. Michelson in 1881, repeated with greater refinement by E. W. Morley in 1887, and again repeated with greater care by E. W. Morley and D. B. Miller in 1905. It is generally called the «Michelson-Morley Experiment.»

The fundamental idea is as follows: A beam of light from a source $S$ is divided by partial reflection at a plate of glass $A$ into two portions traveling along the paths $AM_1$ and $AM_2$. These portions are reflected back by mirrors at $M_1$, $M_2$, and, on striking the plate again, a part of the beam from $M_1$ is transmitted and a part of that from $M_2$ is reflected, the two being brought to interference at $C$.

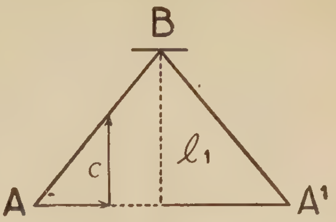


Suppose the whole apparatus moving with velocity $v$ in the direction $AM_2$. Let $c$ be the velocity of light. As the light goes from $A$ to $M_2$ its velocity relative to the apparatus is $c-v$, while on the return journey it is $c+v$. The time to pass from $A$ to $M_2$ and back again is then

$$\frac{l_2}{c-v}+\frac{l_2}{c+v}=\frac{2l_2c}{c_2-v_2}.$$

Since the apparatus moves the distance $v$ while light moves the distance $c$, the beam passing from $A$ to $M$ and back describes a path $ABA'$ in space. By similar triangles

$$AB=\frac{cl_1}{(c^2-v^2)^{\frac{1}{2}}}=BA'.$$



The time required to describe the path $ABA'$ is then

$$\frac{AB}{c}+\frac{BA'}{c}=\frac{2l_1}{(c^2-v^2)^{\frac{1}{2}}}.$$

The retardation in time of the former beam relative to the latter when they are brought together again is

$$2\left\{\frac{l_2c}{c^2-v^2}-\frac{l_1}{(c^2-v^2)^{\frac{1}{2}}}\right\}. \qquad (1)$$

If now the whole apparatus is rotated 90 degrees so that $AM_1$ is in the direction of motion, $l_1$ and $l_2$ change places and the retardation becomes

$$2\left\{\frac{l_2}{(c^2-v^2)^{\frac{1}{2}}}-\frac{l_1c}{c^2-v^2}\right\}.$$

The change in retardation is

$$2(l_1+l_2)\left\{\frac{c}{c^2-v^2}-\frac{1}{(c^2-v^2)^{\frac{1}{2}}}\right\}.$$

This should result in a displacement of the interference fringes when the apparatus is rotated. No such displacement was found, though the effect due to a velocity one-tenth that of the earth in its orbit could have been detected in the experiment of Morley and Miller.

Fitzgerald and Lorentz independently suggested that motion might cause a change of length in the direction of motion. If all lengths in the direction of motion are decreased in the ratio

$$\left(1 - \frac{v^2}{c^2}\right)^{\frac{1}{2}},$$

(1) becomes

$$2\left\{\frac{l_2}{(c^2 - v^2)^{\frac{1}{2}}} - \frac{l_1}{(c^2 - v^2)^{\frac{1}{2}}}\right\}$$

and after rotation through 90 degrees the retardation has the same value. Hence the null effect in the Michelson-Morley experiment is explained.

If we accept this explanation the difficulty is only moved one step farther. While we could compare lengths of objects moving with known velocities it would be impossible to determine the absolute distance of points in space. For the only way we can measure distances is by means of material scales. If such scales are subject to the Fitzgerald contraction, scales moving with different velocities give different values for the distance between the same points of space. Since no means has been found for determining which scales are moving and which are not, there appears to be no way of determining, and so defining the distance between two points.

Similar difficulties are encountered when we try to determine simultaneous instants of time at different points. The ordinary way of transferring time from a point *A* to a point *B* is by moving a clock from the one point to the other. If the clock is subject to the Fitzgerald contraction, however, its parts will change length when in motion. This may change the period of vibration, and so the time determined at *B* will depend on the speed which the clock is moved and the path along which it is moved from *A* to *B*. Any other mechanism (velocity of chemical action, for example), may be similarly affected. If we attempt to transfer time by means of light or electromagnetic signals, since the absolute distance between points is unknown, we cannot determine the interval required for the signal to pass from *A* to *B* and, even if the distance were known, the time of passage would seem to depend on the absolute velocities of *A* and *B*.

**Einstein's Relativity of Time and Space.**—In 1905 A. Einstein took up the question as to what might properly be understood by time and space. He assumed a system of points at rest with respect to each other and with respect to a system of co-ordinate axes. This means merely that an observer attached to the system and measuring distances with a scale finds no evidence of motion. He further assumes a system of clocks attached to the points on which time can be measured. It is necessary first to synchronize the clocks, i.e., determine simultaneous instants of time at the different points. To do this a ray of light starts from a point *A*, goes to a point *B*, and is there reflected back to *A*. Let $t_a$, $t_a'$ be the times on the *A*-clock when it starts and when it returns, and $t_b$ the time on the *B*-clock when it is reflected. If

$$t_b - t_a = t_a' - t_b, \qquad (2)$$

the clocks at *A* and *B* are said to be synchronous. This definition merely expresses that the time required for light to go from *A* to *B* equals the time required to return. This is a case of the principle of relativity. For if a means of measuring time existed such that the absolute motion of the system made these intervals different, it could be used to detect absolute motion.

In referring to the time of an event it is always understood that the time is measured on the clock at the point where the event occurs.

Let $S'$ be a second set of points at rest with respect to each other but appearing to the inhabitants of $S$ to move with velocity $V$. The same events may be observed by the inhabitants of $S$ and $S'$, each measuring time with his own clocks and distance with his own meter stick. Einstein's first fundamental problem was to determine the relation between the distances and times thus obtained. To do this he made two assumptions which are generally called the first and second postulates of relativity.

I. *The Principle of Relativity.*—The laws of physical phenomena are the same whether stated in terms of one system of co-ordinates or another moving with constant velocity with respect to it.

II. *The Principle of Constant Light-Velocity.*—The velocity of light is a constant independent of its source and of the system with respect to which it is measured.

The principle of relativity as here stated is equivalent to the impossibility of defining absolute motion. For, if there were any law that differed at different velocities of the reference system, that law could be used to distinguish such differences of absolute velocity, and, conversely, such differences could only be detected by observing some phenomenon which changed with the velocity.

That the velocity of light is independent of the observer is a special case of the principle of relativity. That it is independent of the source is a physical assumption for which there is considerable independent evidence. For example, if the velocity of light changed with the velocity of the source, the total change in the time of passage of light from some of the fixed stars would be so great that the star would be seen in two different points of its orbit at the same time.

Let $OX$, $OY$, $OZ$ be a system of rectangular axes in $S$, the $X$-axis pointing in the direction of motion. Let $O'X'$, $O'Y'$, $O'Z'$ be a similar set of axes in $S'$, the two origins coinciding when

$$t = t' = 0$$

Let $t$ be the time and $x$, $y$, $z$, the co-ordinates of a point when the inhabitants of $S$ see an event occur. Let $t'$ be the time and $x'$, $y'$, $z'$ the co-ordinates of the point where the inhabitants of $S'$ locate the same event. We shall now determine the equations connecting $x$, $y$, $z$, $t$ and $x'$, $y'$, $z'$, $t'$.

These equations must be linear. For a free particle appears to both observers to move in a straight line with constant velocity. Hence a first degree equation should transform into a first degree equation. Since each particle of

$S'$ moves parallel to $OX$ with velocity $V$, the equations have the form

$$\begin{aligned} x' &= a_1(x-vt)+a_2y+a_3z, \\ y' &= b_1(x-vt)+b_2y+b_3z, \\ z' &= c_1(x-vt)+c_2y+c_3z, \\ t' &= d_1x+d_2y+d_3z+d_4t. \end{aligned}$$

The first three equations show that the points $y=0$ lie in a fixed plane of S′. Similarly, the points $z=0$ lie in a fixed plane of S′. These may be taken as the planes $y'=0$ and $z'=0$, respectively. By symmetry these planes in $S'$ will be perpendicular, for there is no reason why one of the angles they determine should be greater than the other. In the same way the points $x-vt=k$, when $k$ is constant, lie in a fixed plane of $S'$ perpendicular to $O'X'$. Hence the equations reduce to the form

$$\left.\begin{aligned} x' = \beta(x-vt),\ y' = ly,\ z' = mz \\ t' = d_1x+d_2y+d_3z+d_4t. \end{aligned}\right\} \qquad (3)$$

A particle starting from the origin at $t=0$ and moving with respect to $S$ with the velocity $c$ of light has co-ordinates satisfying the equation

$$x^2+y^2+z^2=c^2t^2. \qquad (4)$$

By Einstein's second postulate, the same particle moves with velocity $c$ with respect to $S'$. Hence (4) must have as consequence

$$x'^2+y'^2+z'^2=c^2x'^2.$$

By substituting the values from (3) and comparing with (4) we get

$$\beta^2v=-c^2d_1d_4,\ d_2=d_3=0,$$

$$l^2=m^2=\beta^2-c^2d_1^2=\frac{1}{c^2}\left[c^2d_4^2-\beta^2v^2\right].$$

Solving these equations and substituting in (3), we get

$$x'=\beta(x-vt),\ y'=ly,\ z'=lz,\ t'=\beta\left(t-\frac{vx}{c^2}\right), \qquad (5)$$

where

$$\beta=\frac{1}{1-\frac{v^2}{c^2}}$$

Solving for $x, y, z, t$, we get

$$x=\beta(x'+vt'),\ y'=\frac{1}{l}y',\ z'=\frac{1}{l}z', \qquad (6)$$

$$t=\beta\left(t'+\frac{vx'}{c^2}\right).$$

If these are to have the same form as (5), except for the change in the sign of $\beta v$, we must have

$$l=1.$$

Hence, finally,

$$x'=\beta(x-vt),\ y'=y,\ z'=z,\ t'=\beta\left(t-\frac{vx}{c^2}\right). \qquad (7)$$

These are known as the Lorentz transformations because Lorentz first obtained similar formulas in his work on electromagnetic theory.

**Consequences of Einstein's Theory.**— The equations

$$y'=y,\ z'=z,$$

show that distances in a moving system perpendicular to the direction of motion are the same whether measured by an observer moving with the system or one at rest.

Let $x_1'$, $x_2'$ be the co-ordinates of two fixed points in $S'$ in a line parallel to the direction of motion. Then

$$x_1'=\beta(x_1-vt),\ x_2'=\beta(x_2-vt).$$

The distance between these points appears to the observer in $S$ to be

$$x_2-x_1=\frac{1}{\beta}(x_2'-x_1')=\sqrt{1-\frac{v^2}{c^2}}\,(x_2'-x_1').$$

A body moving with velocity $v$ thus appears to an observer at rest to be reduced in the direction of motion in the ratio.

$$\sqrt{1-\frac{v^2}{c^2}}.$$

A sphere in motion appears to an observer at rest to be an ellipsoid. This is the Fitzgerald contraction used to explain the Michelson-Morley experiment.

From (7) we get

$$t=\beta\left(t'+\frac{vx'}{c^2}\right).$$

If $t_1'$ and $t_2'$ are measured at the same point of $S'$

$$t_1=\beta\left(t_1'+\frac{vx'}{c^2}\right),\ t_2=\beta\left(t_2'+\frac{vx'}{c^2}\right),$$

whence

$$t_2'-t_1'=\frac{1}{\beta}(t_2-t_1)=\sqrt{1-\frac{v^2}{c^2}}(t_2-t_1).$$

Intervals of time on a moving clock are thus less than the corresponding intervals indicated by fixed clocks in the ratio $\sqrt{1-\frac{v^2}{c^2}}: 1$. This is independent of the direction of motion. If then the particle moves around a closed path and returns to its starting point, the time elapsed will be less on the moving clock than on fixed ones. In particular, if the clock moves with the velocity of light, $v=c$ and $t'_2=t'_1$. In a system moving with the velocity of light, time is thus constant.

Differentiating (7), we get

$$\frac{dx'}{dt'}=\frac{dx'}{dt}\,\frac{dt}{dt'}=\frac{\frac{dx}{dt}-v}{1-\frac{v}{c^2}\frac{dx}{dt}}.$$

Similarly,

$$\frac{dy'}{dt'}=\frac{\frac{dy}{dt}}{1-\frac{v}{c^2}\frac{dx'}{dt}},\quad \frac{dz'}{dt'}=\frac{\frac{dz}{dt}}{1-\frac{v}{c^2}\frac{dx}{dt}}$$

If then the velocity of a particle has components $u_x$, $u_y$, $u_z$ with respect to $S$ and $u_x{}^1$, $u_y{}^1$, $u_z{}^1$ with respect to $S^1$,

$$u_x'=\frac{u_x-v}{1-\frac{vu_x}{c^2}},\ u_y'=\frac{u_y}{1-\frac{vu_x}{c^2}},\ u_z'=\frac{u_2}{1-\frac{vu_x}{c_2}}. \qquad (8)$$

These formulas give the result of subtracting a velocity with components $v$, $o$, $o$ from one with components $u_x$, $u_y$, $u_z$. The result is not obtained as in ordinary mechanics by merely subtracting corresponding components.

In relativity mechanics the mass of a particle is not constant but depends on its velocity. The mass is determined by assuming that the mutual actions of a system of particles do not change the total momentum with respect to a given system. Suppose $m_o$ is the mass of a ball at rest and $m$ its mass when moving with velocity $v$. Take two identical balls, one attached to a system $S$, considered at rest, the other attached to a system $S'$ moving with velocity $v$. Through a collision of the two balls, let the one in $S'$ be deflected with velocity $u$ along the $y'$-axis. Its velocity parallel to the $y$-axis in $S$ will be

$$\frac{u}{\beta}.$$

Also, by the principal of relativity the ball in $S$ will have the velocity $-u$ along the $y$-axis. Since neither ball had any velocity along that axis before collision, the conservation of momentum requires

$$\frac{mu}{\beta} - m_0 u = 0,$$

whence

$$m = \beta m_0 = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}} \qquad (9)$$

The force acting on a particle is defined as the rate of change of momentum

$$F = \frac{d}{dt}\,(mv),$$

where $m$ is the mass and $v$ the velocity, all quantities being measured by the same observer. The work done by this force in moving the particle a distance $ds$ is

$$Fds = \frac{ds}{dt}\,d(mv) = vd(mv).$$

Using the above value of $m$, this reduces to

$$Fds = c^2 dm.$$

The result is the increase in the kinetic energy of the particle. Hence the increase in kinetic energy is equal to the increase in its mass multiplied by the square of the velocity of light. If now the body comes to rest, this increase in mass will be transmitted to other bodies as energy. It is then reasonable to assume that mass and energy are merely different aspects of the same entity. In ergs of energy, one gram of mass is equivalent to

$$c^2 = (3 \times 10^{10})^2 = 9 \times 10^{20},$$

approximately.

Similarly, an amount of energy $E$ has the mass

$$\frac{E}{c^2} \qquad (10)$$

This means that energy has inertia just like ordinary mass.

Mass and energy cannot be treated separately. If we make a division of the total into material mass $M$ and energy $E$, the laws of conservation of mass and energy in an isolated system are expressed by the equivalent equations

$$M + \frac{1}{c^2}\,E = \text{const.}, \quad E + c^2 M = \text{const.}$$

**Four-Dimensional Geometry of Minkowski.**— An event occurs at a point $x$, $y$, $z$ and at a time $t$. Minkowski considered the four variables as the co-ordinates of a point in a space of four dimensions. The motion of a particle is represented by a line in that space. In his first paper Minkowski used as co-ordinate along the time axis $ct\sqrt{-1}$. In a later paper of Minkowski and in most of the papers of more recent writers the co-ordinate along that axis is $ct$. The four co-ordinates are then

$$x_1 = x,\ x_2 = y,\ x_3 = z,\ x_4 = ct.$$

The Lorentz transformations appear as the changes of variable from one set of co-ordinate axes in the four-dimensional space to another. The values of $x$, $y$, $z$, $ct$ obtained by observers moving with different velocities are merely the co-ordinates of the same point in four dimensions referred to different axes.

The principle of relativity requires that when stated in this four-dimensional form, physical laws must be independent of the axes used. That is, the laws of physics must be expressible by equations invariant in the space of Minkowski.

Take two points $x_1$, $y_1$, $z_1$, $ct_1$, and $x_2$, $y_2$ $z_2$, $ct_2$ in the four-dimensional space. The quantity

$$s = \sqrt{c^2(t_2 - t_1)^2 - (x_2 - x_1)^2 - (y_2 - y_1)^2 - (z_2 - z_1)^2}$$

may be considered as a sort of distance between the points. By applying the Lorentz transformations it is easily shown to be independent of the reference system. In particular, if the two points represent consecutive positions of a moving particle

$$ds = \sqrt{c^2dt^2 - dx^2 - dy^2 - dz^2} = cdt\sqrt{1 - \frac{u^2}{c^2}},$$

where $u$ is the ordinary velocity of the particle.

The various positions of a moving particle are represented by a curve in the four-dimensional space. Any kinematical property of the motion is represented by a geometrical property of the curve. If $r$ is the vector from a fixed origin to any point of the curve,

$$w = \frac{dr}{ds}$$

is a vector of unit length tangent to the curve at that point. If $m_0$ is the rest mass of the particle $m_0 w$ is called its extended momentum. It can be written

$$m_0 w = \frac{mu}{c} + mk_4,$$

where $u$ is the vector representing ordinary velocity and $k_4$ is a unit vector along the time axis. Since $mu$ is the momentum of the particle and $m$ its energy or mass, the laws of conservation of momentum and of mass or energy of an isolated system are all expressed by the one equation

$$\Sigma m_0 w = \text{const.}$$

In all the interactions of a system of particles, the total extended momentum is thus constant.

To give any adequate conception of the form in which Minkowski represented the equations of electromagnetic theory, it would be necessary to use a considerable amount of four-dimensional vector-analysis. It is sufficient to say that there exists a four-dimensional two-vector (analogous to a directed section of a plane) $M$ resolvable into a sum of two parts

$$M = H + E,$$

where $H$ lies in the three-dimensional space and $E$ passes through the time axis. The magnetic intensity is a vector in the observor's space perpendicular to $H$ and the electric intensity a vector along the line in which $E$ intersects that space. The various values of magnetic and electric intensity as seen by observers moving with different velocities are obtained by referring this same two-vector $M$ to different sets of four-dimensional co-ordinate axes.

To an observer moving with a given velocity, spatial forms can be represented in three dimensions. To an observer moving with a slightly different velocity, there appears a slightly different space. Since the practicable range of velocity is so small, we can to a high degree of approximation consider these spaces the same. If we could experience all velocities up to that of light, the ensemble of all such spaces would be the four-dimensional space of Minkowski. If the principle of relativity is correct, this four-dimensional universe has as great reality as the three-dimensional one consciousness presents to us, but as yet our experiences have been limited to only a thin section of it.

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**RELAY.** See Electrical Terms.

**RELEASE,** *in law,* is the name given to a common-law conveyance, in which the word «release» is the operative verb. A release operates in five modes: (1) By passing an estate, as when a joint-tenant or coparcener conveys his estate to his cojoint-tenant or coparcener; (2) by transferring a right, as when a disseizee (a person who has been unlawfully dispossessed) discharges his right to the disseizor; (3) by extinguishment, as the lord releasing his seignorial rights to his tenant; (4) by enlarging a particular estate into an estate commensurate with that of the person releasing; (5) by entry and feoffment, as a disseizee releasing to one of two disseizors, which is equivalent to entry on the property and enfeoffment after putting an end to the disseizin. Blackstone says (‹Commentaries,› book II and chap. 20): «Releases are a discharge or conveyance of a man's right in lands or tenements to another that hath some former estate in possession.» In simple language a release is the discharge of a right, by an instrument in writing, by which estates, rights, titles, entries, actions and other things are extinguished and discharged; and, in general, the term signifies a person's surrender of the right or action he has, or claims to have, against another or his lands.

**RELIANCE.** An American yacht. See Yachts and Yachting.

**RELICS,** the mortal remains of departed saints; also, objects associated in memory with them, such as articles they used in life — clothes, vestments, the pectoral cross or the pastoral staff of a holy bishop, or the like: similar reminders of the life and death of Jesus Christ are also relics; and the religious veneration of all such relics when they are duly authenticated is expressly approved by the Catholic Church. The Council of Trent in Sec. xxv of its Acts and Decrees regarding invocation of saints condemns those who hold that «veneration and honor is not due to relics of saints»; but all the Protestant churches teach that veneration of relics, or relic worship, is a sin of the nature of idolatry. In favor of the Catholic doctrine is cited the teaching of the early Fathers, who find both in the Hebrew Scriptures and in the New Testament the highest sanction for the veneration of relics, for example, the incident of the coming to life again of a corpse on contact with the bones of the prophet Eliseus (Elisha: 2 Kings xiii, 21); and that recounted in Acts xix, 12 (compare v, 15), of sick persons being healed with «handkerchiefs or aprons» that had touched the living body of Saint Paul: «there is a power,» says Saint Cyril of Jerusalem (*Catecheses* xviii) «latent even in the bodies of the just.» And the practice of the faithful in the first ages of the Church is fully consonant with this belief in the physical and spiritual efficacy of relics. The early Christians were careful to save the remains of martyrs from desecration. In the year 107 the bones of Saint Ignatius, bishop of Antioch, were gathered and wrapped in fine linen, to be guarded thereafter «as a priceless treasure left to the Holy Church.» In the year 167 the faithful of Smyrna exhumed the remains of their bishop, Saint Polycarp, who had been burned alive 10 years before under Marcus Aurelius and treasured them as «more precious than costly stones and more valuable than gold.» When Saint Cyprian, bishop of Carthage, was about to be decapitated (258 A.D.), the Christians cast towels and napkins before him that they might be soaked in his blood. After the persecutions were over, the practice of veneration of sacred relics persisted in the Church, as is testified by the writings of Saint Ambrose, Saint Augustine, Saint Jerome and indeed by all the Fathers of the 4th and 5th centuries. In all ages there have been abuses connected with the practice. A canon of the Fourth Council of Lateran in the year 1215 forbade relics to be sold or to be exposed outside of their cases or shrines and prohibited the veneration of new relics till their authenticity had been approved by the Pope: and these laws are confirmed in decrees of the Council of Trent. The veneration of relics has attained its maximum in the Roman Church and there, according to Addis and Arnold (‹Catholic Dictionary›), these articles comprise the «bodies, or fragments of the bodies of departed Saints: articles, or portions of articles, which they have used; the holy nails, lance, spear, or fragments of the True Cross; and the girdle, veil, etc., of the Blessed Virgin.» In the Roman Breviary there are special offices for the Most Holy Relics (to be said on the fourth or last Sunday in October), for the Crown of Thorns, the Lance and Nails, etc.

**RELIEF,** *in old English law,* a fine or composition paid by the heir of a tenant, holding by knight's service or other tenure, to the lord on the death of the ancestor for the privilege of succeeding to the estate, which by strict feudal law had lapsed or fallen to the lord on the death of the tenant.

*In physical geography,* the undulations or surface elevations of a country.

*In painting,* the appearance of projection and solidity in represented objects, so as to cause them to appear precisely as they are found in nature.

*In sculpture and architecture,* the prominence of a figure from the plane surface to which it is attached; according to the degree of prominence, it is known as alto-relievo or high relief, mezzo- or demi-relief and bas- or low-relief.

In ordinary language, release from a post or duty by a substitute, who may act either permanently or temporarily; specifically, the release of a sentry from his post, which is taken by another soldier, also the person who thus relieves or takes the place of another.

**RELIEF SCULPTURE.** See SCULPTURE.

**RELIGIO MEDICI** was the first of Sir Thomas Browne's books and has always been the one most generally read. It was first printed in an unauthorized edition in 1642, followed in the next year by an edition under Browne's own supervision. The book was the fruit of much reading and much quiet observation and reflection, but is not Browne's most characteristic work. Enthusiasts are more likely to turn to his ‹Pseudodoxia Epidemica or Enquiries into very many received Tenets and commonly presumed Truths› (1646) or to his ‹Hydriotaphia, Urneburiall› (1658) as giving with fullest body the peculiar flavor of Browne's somewhat whimsical personality and as exemplifying that sombre magnificence of style in rhythm and phrasing, not unworthy to be compared with Milton's at their best, which is the special virtue of Browne's most admirable prose. The preference of the general reader for ‹Religio Medici› is largely due to its theme and to Browne's highly characteristic attitude toward this theme. The religion of a physician, to translate Browne's title literally, is an arresting topic. It is always interesting when a man who has been deeply concerned with the facts of the natural world abandons himself to speculation on the supernatural possibilities of human existence. Browne's interest in this subject is almost purely speculative. He lived in an age of controversy and at a time when dogmatic opinion flourished, but he acknowledged himself unsuited to follow the controversial method and unable to condemn categorically opinions which he could not share. If one sought for it, so he thought, one would find some good in everything. His habit of mind was to steer a middle course between credulity and scepticism, with a strong leaning toward the latter. But nobody so charitable toward strange views as the sceptic turned loose in the field of speculation, and in reading Browne, one is continually being caught up by his defense of such opinions as the belief in witchcraft, by his apparent desire to put faith in the existence of «changelings» (though he will not go so far as to say that a man can be «despeciated» into a horse), or by his occasional defense of ecclesiastical practices which in his day the normal Protestant (and Browne asserted that the only thing he disliked about Protestantism was the name) would never have thought of defending. In short, Browne loved to sport in paradox and intellectual hyperbole, habits of mind often annoying to the literal-minded reader. Beneath these eccentricities, however, there lay a solid foundation of character and belief, an open-mindedness and readiness to see the best in everything, which make of him a better proponent of his views than an orthodox dogmatist, or a bitter iconoclast could have been.

GEORGE PHILIP KRAPP.

**RELIGION** has been variously defined according to a multitude of epistemological and ethical systems. The pantheist Hegel takes it to be «the knowledge acquired by the finite spirit of its essence as Absolute Spirit.» Kant makes duty to follow his categoric imperative of the practical reason; and religion to be «the recognition of all our duties as divine commands.» Huxley defines religion as «reverence and love for the ethical ideal, and the desire to realise that ideal in life.» According to Max Müller, religion is «the perception of the infinite.» Schleiermacher says, it is «a determination of man's feeling of absolute dependence.» Matthew Arnold, the apostle of sweetness and light, finds that religion is «morality touched by emotion.» The latest definition is that of Reinach, ‹Orpheus› (1909): «Religion is a collection of scruples that are a stumbling-block to the free exercise of our faculties.»

Waiving these definitions, based upon false philosophical systems, one may begin by conceiving a man's religion as his Godwardness. Cicero, ‹De Natura Deorum,› II, xxviii, derives *religio* from *re-legere,* to re-collect, to recall to mind, to reflect. Lactantius, ‹Institutiones Divinæ,› IV, xxviii, throws over this derivation, and traces *religio* back to *re-ligare,* to bind again. This etymology is commonly accepted. Man is bound to God as creature to Creator; by religion he renews this bond, whensoever in word or deed he acknowledges a dependence upon God. Religion, then, in its essence, is generically a practical acknowledgment of man's dependence upon a Supreme Power that is beyond control. This article will treat: first, revealed religion as it is accepted by those who believe in the supernatural revelation of God to man; second, natural religion, as it is found among those who admit not that supernatural revelation.

**I. Revealed Religion.**— They who believe in God's revelation of Himself to the human race as the basis of religion do not deny that man's acknowledgment of dependence upon God is postulated by the very nature of the universe; to this form of natural religion they superadd the obligation of worship consequent upon revelation. «What is known of God is clear» even to the heathen. For, «ever since the creation of the world, the unseen truths about God, — His everlasting power and divinity, — are to be reasoned out and seen by His works» (Romans i, 19–20). And yet «God, who of old, at many times and in many places, spoke to our ancestors by the prophets, hath in these latter days spoken to us by a Son» (Hebrews i:1–2). This communication of truth by God to the human race through the prophets and the Son is the basic fact of revealed religion.

**1. Possibility of Revelation.**— Subjective idealists and Kantians deny the possibility of revelation; for, in their systems of philosophy, knowledge has no objective validity, and there can be no certainty that God speaks to man. The adherents to revealed religion believe in a Personal Deity, Creator of man. Since this Creator has bestowed upon man the faculty of communicating his ideas with fellow-men, He undoubtedly may in like manner communicate with us. The deist errs in assigning to God such transcendence as to preclude the possibility of revelation. For the infinity of God includes omnipresence; and His omnipotence demands that He may communicate with His creature wherever He is. Such communication is not opposed to the divine wisdom. For the authority of God revealing gives to man greater certainty of religious and moral truth than does the authority of reason unaided by revelation. Moreover, fallen human nature, tainted by original sin, has tendencies to evil that are consequent upon concupiscence. God, in His wisdom, meets this fallen condition by the manifold graces of revealed religion. Nor has human reason any such Kantian autonomy as to preclude the possibility of God's revelation to man. For the soul that reasons is created by God. But God is a Person, and every person acts with a purpose. Therefore, God created the reasoning soul with a purpose. But in this divine purpose, God may intend a supernatural end, and may reveal this end to man; and man's reason has no right to reject the revelation. Hence neither the wisdom of God nor the Kantian autonomy of reason precludes the possibility of supernatural revelation to the human race.

**2. Knowability of Revelation.**— Granted the possibility of revelation, how can man be certain of the fact that God has spoken? Time-honored criteria are given, by which one may be at least morally certain that in revealed religion God has entrusted truths of faith and morals to the human race. These criteria are miracles, prophecies fulfilled, the heavenliness both of the truth communicated and of the effects of that communication in the souls of men. No prudent man has any right to deny that a code of faith and morals is revealed religion, if that code does not contradict right reason, instills the practice of virtue even in an heroic degree, effects lives of virtue among men in every clime and down through many centuries, has been given to the world by one who claimed to have received it from God and made good his claim by miracles and by true prophecies, and has been handed down to the world by a never-failing body of teachers instituted by the founder as a part of his revealed religion.

**3. Fact of Revelation.**— The Old Testament is clear witness to the fact of God's communication with the human race. Such communication is frankly admitted, and logically defended, by those who accept this collection of sacred books as God's own word. The Old Testament is an history of the human race from its inception, and of God's revelation of Himself to that race. This history is not chronology nor critical work, but fact-narrative in primitive and popular form. It begins as a primitive tradition, and gradually approaches nearer and nearer to the form of popular history. Herein are taught the beginnings of revealed religion by God's messages to Adam; the evolution thereof by the Messianic prophecies to Abraham, Isaac and Jacob; the still further development of true religion by frequent revelations to Moses; the carrying on of these revelations through the prophets of Israel and Judah. Herein also the miracles of the Exodus, and the theocratic rule of Jahweh over the flock of his pasture are clearly attested. One has to deny the divine authority of these books, if one admit not the fact of revelation in the Old Law.

The New Testament is replete with just such proofs of God's revelation to the human race in His Son.

*First,* Jesus made claim to a divine ambassador. According to the witness of John alone, the claim was made 32 times. This divine ambassador again and again insisted; «My teaching is not mine, but His who sent me» (John vii, 16); «As the Father hath sent me, so I send you» (John xx, 21).

*Secondly,* Jesus appealed to His Future resurrection in proof of the truth of His claim, that He was the ambassador of God the Father, and that He had from God the Father a message for the world. Witness the sign of Jonas: «Just as Jonas was in the belly of the sea-monster three days and three nights, so shall the Son of Man be in the earth three days and three nights» (Matthew xii, 39–41). Witness the sign of the Temple: «'Destroy this temple, and in three days I will raise it up' . . . He was speaking of the temple of His body» (John ii, 18–22). Witness the repeated and detailed prophecy of the oncoming death and resurrection of Jesus: «He shall be delivered to the Gentiles; and shall be mocked, and scourged, and spat upon. And after they shall have scourged Him, they shall kill Him. And the third day He shall rise again.» This prophecy is given three times by Mark (viii, 31; ix, 11–13 and 30; x, 33–34), three times by Matthew (xvi, 21; xvii, 12 and 22–23; xx, 18–19), and twice by Luke (ix, 22; xviii, 31–34). There can be no doubt about the fact. Jesus clearly appealed to His future resurrection in proof of the truth of His claim that He had from the Father a message for the world.

*Thirdly,* Jesus arose from the dead to fulfil His prophecy in proof of the truth of His claim to the divine ambassadorship, to the message from the Father, to the right to give that message to the world. This clear fact is denied only by those who start by throwing out of court miracles, prophecies and all the supernatural elements of religion.

*Lastly,* Jesus consigned to a teaching body the very same message which He had from God the Father, and conveyed to that teaching body the right to have and to hold and to hand down that message to the world. 1. Just before His ascension, He appeared to the 11 apostles in Galilee and said to them: «All power hath been given me in heaven and upon earth. Therefore go ye, make disciples of all nations, baptise them in the name of the Father and of the Son and of the Holy Ghost, teach them to observe all things whatsoever I have commanded you. And, lo, I am with you all days, even to the end of the world» (Matthew xxviii, 18–20). 2. On the very point of ascending into heaven from Mount Olivet, Jesus once again gave this solemn message to the same body of teachers: «Go ye to all the world, preach the Gospel to all creation. He that believeth and is baptised, shall be saved. He that believeth not, shall be damned» (Mark xvi, 15–16).

Such is a brief outline of the possibility, knowability and fact of revelation,— the all-important elements of revealed religion of the Old Testament and the New.

**Bibliography.**— Ottiger, 'Theologia Fundamentalis' (1897); De Broglie, 'Religion et Critique' (1906); Hettinger, 'Revealed Religion,' Eng. trans. (1895); Drum, 'Divinity of Christ' (1918); Schmidt, 'La révélation primitive' (1914).

**II. Natural Religion.**— Under this heading will be treated religion as it is found in the history of peoples who have not accepted the Bible, the inspired Word of God to the human race. These various forms of religious belief are all degenerations from primitive revelation. In some is found the pantheistic tendency of identifying subject and object; most are theistic in separating the worshipper from the object worshipped. These theistic cults are at times monotheistic, though generally polytheistic. Monotheism is the worship of one Supreme Power. Polytheism is the worship of many gods. In polytheistic religions, the Supreme Power is found to have degenerated into an obscure form, which faintly preserves the unity and supremacy of the All Father of monotheism. Sometimes the relic of the Supreme Power of primitive revelation may be marked in what Max Müller calls *henotheism,* the singling out of a particular god for a seemingly monotheistic reverence. By such henotheistic praises, Sumerian hymns extol Marduk and Sin with the attributes usually assigned to various other deities. A second obscure form of the Supreme Power is the chief of the gods, the *Prytanis* or president of the assembly of immortals, as Zeus in Homeric theogony; or, again, the dimmed Power called Fate, which in Greek classic tragedy controls both gods and men. Finally the Supreme Power, in the Upanishads of India, has been vaporized into an all-pervading, pantheistic Spirit. Modern pantheism has evolved this all-pervading Spirit into a completely evaporated, ethereal and generally impersonal Being,— the Absolute, which is all that is, and apart from which is naught that is.

Rationalistic historians of religion assume that all these various forms of monotheism, henotheism, polytheism, pantheism, are an evolution of the consciousness or emotion of man that has been due to sociological or other environment. They deny that the Personal Deity has revealed Himself to man; scout the very idea that all forms of pagan cults are mere degenerations from primitive revelation; and try to explain as purely natural the worship of a Supreme Power which must be admitted to be universal, be it never so obscured and vaporized.

**1. Theories of the Origin of Religion.**— The chief theories, whereby rationalists strive to explain the empirical fact of an universal cult of a Supreme Power, are animism, totemism and magic. These theories all start from a false assumption. It is assumed that the present state of civilization and religion has resulted from evolution. Primitive man was a brutish cave dweller; and from a neolithic state he has been evolved into that of culture. The religion of cultured man is in like manner an evolution from primitive forms. Hence the lower its civilization the nearer is a race to primitive religion. One must study religion as it is in savage peoples in order to come near to the primitive religion of mankind. All this is groundless assumption and progressive assertion. Fiction is proposed as fact; emphasis takes the place of logical reasoning.

The Biblical narrative of the creation of man with at least a normal intellectual equipment, and of the descent of the human race from the created pair, is the only authoritative witness we have about primitive man, and stands the test of all argument based upon whatsoever facts the spade has upturned and literature has preserved. There is absolutely no proof that a prehistoric, neolithic man ever existed. The Neanderthal man and other abnormalities of such sort have turned out to be nothing more than mere degenerations. Profane history takes us back about 7,000 years, and no farther. Bible history takes us back farther, even to the beginning of the race, but not in the form of chronology. Early traditions, as handed down by Genesis, are not chronological history; but only a popular narrative of the story of man and of God's revelation of Himself to man. How long intervened between the creation of man and the beginning of profane history we have no idea. Thousands of years may be allowed for the evolution of the linguistic, sociological and ethnological differences that separated the races at the time profane history begins. The process of this evolution is enwrapped in mystery. We can only argue from the facts to hand.

Chinese pictographs of the dynasty of Shang, second millenium B.C., show the Mongolian characteristics of to-day,— almond-shaped eyes, almost beardless faces and straight hair; while contemporaneous Egyptian hieroglyphic writing is evidence of the modern Western facial traits. A horizontal straight line may be drawn through the eyes that serve as ideographic signs in the West; whereas, in the Far East, such a line is broken into an angle. The inscriptions and carvings on Egyptian temples show that, during the reign of Rameses II, before the Exodus, c. B.C. 1250, the negro, the Semite, the Hittite and the Egyptian were types as ethnologically separated from each other as the Iranian, Semitic and African types are distinct to-day. It is only guess-work to conjecture how long it took to evolve these characteristics which distinguished the races ethnologically in the dim past.

Linguistics throws no more light upon the history of primitive man than does ethnology. So far back as language can be traced, no hint appears of the undoubtedly common original tongue spoken by men. In Mesopotamia, as early as B.C. 4500, the Sumerians spoke a language as much removed from that of their Babylonian conquerors as Hungarian diverges from modern Arabic. The word *hand* in Sumerian was *katu*, and the same root is found in Hungarian *kase* as well as in kindred words of the Lapps and the Finns. Compare with this Sumerian *katu* its contemporaneous Babylonian equivalent *idu;* follow this Semitic root for 7,000 years through Assyrian *idu* and *iadu,* Hebrew *jad*, Aramaic *jada*, Syriac *ida*, Arabic *jad*. The history of these two dissimilar roots, both meaning *hand,* is evidence of the linguistic evolution of peoples, but leaves us in utter darkness about the language of primitive man. Here is another linguistic fact that the present writer has discovered. The Gros Ventres say *itti* for woman, and *enenya* for man. It is strange that the science of language has not yet called attention to the Semitic origin of these forms. Compare the following Semitic words for *woman*: Hebrew, *ishsha*; Aramaic, *itta*; Syriac, *attetha*; Assyrian, *ishshatu*; and for *man*: Hebrew, *enosh*; Aramaic, *enash*; Syriac, *nasha*; Assyrian, *nishu*. There must have been Semitic influence in the history of the Gros Ventres. When? During the reign of Tai-tsong, A.D. 627–649, when Nestorian missionaries introduced Christianity into Mongolia from Persia? Or thousands of years before the Christian era? We know not. This much we know, that the science of linguistics, which cannot explain modern facts of diversity and similarity of language, is helpless to solve the problem of the primitive civilization of the human race.

As comparative ethnology and linguistics fail to reach back to the primitive racial characteristics and language of man, so comparative history of religions can prove only two facts about man's primitive beliefs: 1, that no people has been found to be without some cult of a Supreme Power, into a relation of dependence upon which the individual members entered; 2, that the manifold and multiform evolution of natural religion is due to a degeneration from the unity of revelation. It is a false start to assume that the savages of Africa, America and Australia are nearer to primitive religion than are cultured races. There is no reason to think that, for thousands of years, savages have been linguistically, sociologically and theistically at a standstill; and that they bring us back to primitive conditions wherefrom our more civilized races are evolved. Human nature abhors such a standstill; it either progresses or degenerates, and that most of all in its practice of religious worship. Sometimes this degeneration is in both culture and religion; at other times it is in religion alone. Instances of degeneration in both culture and religion may be found in out of the way places of the United States. The «Pinies» of the neighborhood of Mount Holly, N. J., are said to belong racially to the same stock as the colonial element of Philadelphia; and yet, because of inbreeding and isolation, they have degenerated to the mentality of children and have lost hold of some of the fundamental principles of morality. Instances of degeneration from revealed religion alongside of advance in culture are provided by Leuba, ‹The Belief in God and Immortality› (1916). His figures show that, among the «greater men of science» of the United States, belief in a Personal Deity,— that is, worship of a Supreme Personal Power,— is had by only 34 per cent of the physicists, 16 per cent of the biologists, 32 per cent of the historians, 19 per cent of the sociologists and 13 per cent of the psychologists. It were just as reasonable to study the religious ideas of these cultured atheists, as to examine into the taboos of savage peoples, in the effort to reach back to the origin of religion in the human race.

2. **Animism.**— What has been said in the preceding section applies in general to the rationalistic theories on the origin of natural religion. The three chief theories of to-day will now be more specifically set forth. Animism is the name given by E. B. Tylor, ‹Primitive Culture› (1903), to the faith of primitive man. His theory is pretty much the same as the «Ghost Theory» of Herbert Spencer, ‹Principles of Sociology› (1882); it finds the origin of religion in the tendency to endow material objects with living souls, reason, will and the passions. Just as the child whips a door for naughtily jamming its finger, so primitive man took inanimate things as possessed by souls. It is not clear that the child is not taught to vent its hurt feelings thus foolishly; nor does history prove that the prehistoric savage, whom nobody ever saw, had a child's mental equipment. Still Mr. Tylor is not proving anything. He is theorizing by the process of progressive assertion. We proceed. Primitive man speculated on the differences between a living body and a dead one, a man asleep and awake, the human forms seen in time of waking and of dreaming. He concluded that man had a «ghost soul,» which left him in sleep for a time and in death forever; and that this «ghost soul» appeared to others in their dreams. The ingenious, prehistorical psychologist then speculated on his shadow. It followed him everywhere; was an inseparable companion in hours of consciousness, a very self and yet another self; and thus came to be thought of as an immortal shade. To this «apparitional soul,» which could take a vacation from the body for a time or forever, physical powers were in due season assigned. At times so great were these powers that the «ghost souls» of certain dead men became gods; in this wise ancestor-worship came into being. Later evolutions resulted from this primitive notion of wandering, separate souls. The next step of the clever, neolithic savage was to evolve souls that never existed in human beings. Everything became animated. In child-life, «chairs, sticks and wooden horses are actuated by the same sort of personal will as nurses and children and kittens. In such matters the savage mind well represents the childish stage» (Tylor, *op. cit.* I, 285). Since these «ghost souls» were out of the ordinary and superhuman, the savage felt their power, invoked their aid, feared their wrath, propitiated them with offerings and finally deified them. It is all very simple to those that have the credulity to swallow Mr. Tylor's dose without making a wry face at the gratuitousness of his whole collection of assumptions. Against the animistic theory is the fact that ancestor-worship is not an important factor in the religion of many savages. Moreover, among tribes that worship dead heroes, there is at times found a nature-worship with which no trumped-up «ghost soul» may be associated. The pygmies of the Kongo, probably one of the lowest of extant races, worship a Supreme Being and not their dead heroes. And the studies of Andrew Lang, ‹The Making of Religion› (1909) have led him to hold the «hypothesis of an early Supreme Being among savages, obscured later by ancestor-worship and ghost-gods, but not often absolutely lost to religious tradition» (p. 289).

3. **Totemism.**— The existence of totemism is undeniable; it is a relation of dependence that a people enter into with a *totem* — an animate object or the inanimate representation thereof. Traces of totemism are found all the world over. Objects of totemic cult, or *totems*, were: in ancient Egypt, the bull Apis (sacred to Ptah), the ape (embodiment of Thoth), the cow (sacred to Hathor), the cat (sacred to Bubastis); in India, the sacred cow; among the Canaanites, the stone *phallus* (sacred to Baal), and the wooden *kteis-pole* of Ashera; the Iroquois turtle, the Omaha maize, and so on. Akin to totemism is the worship of a *fetish* (Portuguese *feitiço,* «artificial»),— a charm trinket, idol, a child's hand, a claw, a tooth or any such object. It is arbitrary and unscientific to argue from these degenerations to the religion of primitive man. The primitive, monotheistic acknowledgment of dependence upon a Supreme Power has in all these cases been deteriorated into the senseless relationship of dependence that ignorant people have entered into with sticks and stones and animals, just as

happens in West Indian voodooism and in the stupid superstition with which cultured folk of to-day pick up a pin, hang a horseshoe or study the lie of the leaves in a teacup.

One form of totemism or nature-worship which deserves special mention is cult of the heavenly bodies. The chief school in favor of astral cult as the origin of religion is the Pan-Babylonian. According to Friederich Delitzsch, Gunkel and Winckler, of Berlin, together with Jeremias of Leipzig and a host of university scholars in England and America, the origin of Greek, Roman, Old Testament, New Testament and countless other religions of cultured peoples must be sought in Babylonian solar, lunar and astral mythology, an evolution from the worship of the heavenly orbs. At first an attempt was made to set this theory upon an astronomical fact as a foundation. Winckler assumed that the Babylonians knew the precession of the equinoxes; and upon this fiction built up an absurd hypothesis. Father Kugler, the Jesuit astronomer and Assyriologist, then came into the arena and showed that the whole explanation of Babylonian mythological religion was established upon the Pan-Babylonian school's ignorance of Babylonian astronomy and astrology. Recourse was then had to far-fetched analogies between Bible facts and astral phenomena. Jacob had four wives and 12 sons; and so he becomes the moon-god with four phases and 12 lunar months. With equal assurance, the 12 Apostles are relegated to the realm of fiction as 12 lunar months of a moon-god.

**4. Magic.**— Tylor assumes an age of animism that preceded religion. Frazer, J. G., 'The Golden Bough' (1911), postulates an age of magic that preceded animism. This pre-animism was the conjuration of hidden forces. When such conjuration was found ineffective, petition of superhuman powers took its place. Marett, 'The Threshold of Religion' (1909), starts theorising from a life-force, called *mana* in Polynesia and Melanesia; *mana,* conceived as impersonal, led to magic; *mana,* conceived as personal, led to worship.

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**RELIGION, Established,** or **STATE RELIGION,** that form of religious belief and worship which is recognized by the government or constitution of a country as national and which enjoys certain privileges and is supported by the public treasury or by tithes. The idea of complete separation of civil government and religious affairs is peculiar to modern times. In the ages before Christianity the administration of religious affairs was a function of the state and the priesthoods were orders in the state. After the triumph of Christianity the relations between church and state in the Roman Empire were intimate and the civil power freely intervened in the government of the Church. the prelates of the Church also were vested with extraordinary powers by the state. Throughout the Middle Ages the civil power was everywhere in the last resort the Church's armed right hand for the enforcement of uniformity in religion. For a long time after the Reformation the uniformity of religious belief and ceremonial was held to be indispensable: in the present age, though in many countries state churches exist, controlled by public authority and supported from the public purse, uniformity is no longer enforced by civil penalties and the subject is permitted to reject the state religion, to embrace another religion or to ignore religion; but in some countries dissidents from the religion of the state suffer certain civil disabilities. It is urged in favor of the national recognition of a form of religion, that if the majority of a nation are prevented from making this public recognition of it, as a matter of primary importance to the state's welfare, then they are subject to coercion by the minority; and if an established church uses no sort of coercion, its being supported by the state in the face of a protesting minority is no greater violation of equal rights than would be its disestablishment at the behest of the same minority.

**RELIGION, Influence of the Great War upon.** It is generally impossible to estimate the influence of a war until years after the declaration of peace. So many elements of good and of evil are set in motion by the call to arms that the resultant ultimate influence takes time to reveal itself. The process cannot be hurried. This is particularly the case in a world war including diverse nationalities. A struggle of that magnitude is apt to intensify human passions and the selfish interests of the contending nations, who are likely to regard justice and humanity as of less consequence than success in battle and a point of advantage at the peace table. In such an atmosphere, however grandiloquent the sentiments, there is obviously no opportunity for religion to display its power — it must retire from the shuffle-board of the nations and continue a secondary factor in the world's parliament. Yet in the past it has certainly been the direct or indirect cause of war — there has been no century without its authorized representatives or interpreters inciting the nations to conflict for its greater glory or power. Religions of old failed admittedly to appreciate their opponent's point of view. When argument failed, the invariable recourse was to arms. Each was too full of its own divine right to admit the possibility that a rival creed might have its share of that same authority.

Now it is not to be denied that in the era of the Crusades and in later ages, religion sought often to heal wounds made in its name and furnished illustrious examples of kindly and upright men and women identified with the

Church as teachers or workers in various fields who have enriched humanity. On the whole, however, when religion dominated the state, the religions in the customary ecclesiastical meaning of the term were too absorbed by worldly ambitions under specious masks of humility and piety to realize the divine possibilities at the root of their creeds. The countries were still in deep shadows, when Shakespeare — prolific in such anticipations — wrote that it is the heretic who makes the fire, not he who is burned by the fire. It took some centuries before religion began to advance out of the bogs and sandbanks. Not only the historic creeds, but smaller groups of religionists who forgot to exercise toward others the toleration they demanded for themselves, made religion so empty and delusive a phrase that a Madame Roland might well have exclaimed: «Religion, what crimes are committed in thy name!»

It did not take many months after the Great War began for religion and the religious to show tremendous advance, as they arrayed themselves as partners and no longer as competitors, in the world-embracing task of solving vital problems and meeting conditions which had to be faced in every land, as well as on the battlefield and in the battle zone. The new alignment was peculiar to no clime or creed — it was observable everywhere, but perhaps seen at its best in the United States, which, always free from religious propaganda and debarred by its constitution from making religious tests of any kind, was to witness the most superb illustration of genuine religion on the part of all the creeds. In England, France, Italy, and possibly none the less truly among the Central Powers, the influence of religion made itself quickly felt in the organization of national and international agencies to relieve suffering, to restore, to rebuild, to uplift, to strengthen. The team-work among Catholic, Protestant and Jew was immediate and far-reaching. It did not content itself with the giving of money in vast sums in the aggregate, but developed into the giving of self, into personal service unsurpassed in numbers and variety. From the training camp to the battlefield, so diverse in their claims, thousands of men and women of different faiths were foremost as workers for humanity's sake, above creed and race and nation. Rarely, if ever, in the entire history of mankind was so genuine a spirit of religion aroused. It did not call itself by such a name, but it was none the less a translation of religion into deeds that made for human happiness and hopefulness at an era when the greatest tragedy in history was being enacted.

In the United States, the Y. M. C. A., the Y. W. C. A., the Knights of Columbus, the Jewish Welfare Board, the Salvation Army, co-operated as brethren in a common cause. The Red Cross received its financial support and gathered its workers from all. No narrow sectarianism held sway. In the raising of war relief funds all were contributors without distinction of creed. No hut or building, no canteen or facility was selfishly kept for one organization, but when necessary was placed freely at the disposal of the rest. Thus amid the horrors of war, which used to be intensified so as to aid the Almighty to punish the sinner and the heretic, the oldtime hatreds and dissonances among the creeds were resistlessly swept aside, the high walls of separation became merely lines and the feeling of comradeship and brotherly love was marvelously strengthened.

Many examples of the new birth of religion are told from day to day from sources whose veracity cannot be questioned. In France, an observer, an official in service, writes how Catholic chaplains distributed Jewish prayer books to the Jewish soldiers. At a holy day service not far from the Belgian frontiers, the Y. M. C. A. gave its auditorium at general headquarters for Jewish worship. On a battlefield in Flanders, a rabbi, in the absence of a Catholic priest, held a cross before a dying French soldier and a few moments later the Israelite lost his life as a stray shell exploded. A prominent British official notes that when Sunday came it was no unusual thing to find a series of religious services of all creeds within the same hut back of the front. «At 6:30 will be Communion Service by the Church of England; at 7 o'clock a Roman Catholic Mass; at 8 a Jewish Service, at 8:30 Presbyterian, at 9 the Free Churches, and at 10 the Episcopalian Service again.» As in the United States, in England, too, every British war service agency, by whatever church, synagogue, chapel or meeting hall originated, joined hands in the common cause. Such instances of co-operation of the creeds could be multiplied in gratifying numbers. As to the influence of war in checking racial prejudice, what better illustration can be furnished than the United States War Department's naming a camp after a negro soldier, Camp Alexander, at Newport News, Va. No less significant was the action of the Red Cross Canteen Committee of Chattanooga in distributing food and postal cards and writing letters home for a regiment of negroes.

Now a critic might say: Are not these examples due to transient influences, the sense of common peril, the feeling of *esprit du corps* as is witnessed at school or college, among bodies of business or professional men, without the slightest connection with religion?

The universal sentiment, the broad unsectarian and undenominational atmosphere, this magnificent exhibition of team work unexampled in the entire history of the religions, points to a more significant underlying force than a mere feeling of comradeship, a sense of common danger. Its depth and universality indicate a character more than transient and not due to the circumstances of the hour and scene. A nation that contributes its millions to a war chest in which all elements of the population, rich and poor, Christian and non-Christian, contribute in a spirit of noble emulation, is not likely to forget the lesson, nor will it cherish bigotry in the future in any marked form. The Red Cross, which has raised its millions and hundreds of millions from representatives of every class, creed, sect and color, has enriched the globe in more senses than one and given its cup of refreshment not to the suffering soldier only, but to a world that needed a permanent revival of religion in its genuine form. The fact, too, that these agencies for human relief were largely organized by representative religious bodies and supported mainly by them indicates the vital character of the movements as expressing the sentiment of the creeds in this 20th century. They could not prevent war — they could mitigate its horrors and furnish an example of brotherhood, helpful and hopeful for the future.

Religion has been limited to the religious shrine, to the beauties of ceremonial, to sacred memories and associations, to the fragrance of incense and swelling music. It is held by many to be a rich keepsake of traditional rites and terms of wonderful potency. Others, with as good, if not better, authority, see religion as an active, not passive, force in human life and affairs. It is a power never designed to be a sedative, merely to promote pious contemplation at stated times, but one whose highest aim is to awaken us to practical goodness, not good thoughts alone. It is an influence that ennobles and sanctifies, an atmosphere in which nothing wrong, hurtful or evil can exist. Thus defined it is showing its reality amid stirring years of strife, as it spreads its blessings in a thousand ways, in the wondrous compensations of the Creator; and it trains men and women to be creators in His spirit, as they diffuse kindness, and mutual respect, giving to all the open hand and heart. If it takes war to bring about this result, peace will not long witness its negation.

As to the relation of war to the religion of the individual, perhaps the finest aspiration appears in a letter, dated 9 September, from a sergeant on the battle front in Flanders, to his father, a Georgian clergyman: «War of course may call forth a latent power of self-sacrifice. God grant that some of the heroism and courage now being so prodigally lavished on the battlefield may persist in the days of peace and used in raising up and building anew a broken-down world.» ABRAM S. ISAACS.

**RELIGION, the Psychology of.** The psychology of religion, which originated in this country about 20 years ago, is the application of the principles of general psychology to the interpretation of religious phenomena. It rests upon the fundamental assumption that religious experiences, viewed psychologically, must be of the same essential nature and subject to the same laws as other forms of human conduct.

The first religious phenomenon to be studied was «conversion,» as the term is used in the American Protestant churches popularly called «evangelical» or «evangelistic.» These denominations insist that the individual must consciously pass through some inward transformation of his personality as an assurance of divine acceptance. Their members in consequence had often learned to watch their mental states and to describe such marks of presumed divine favor as they might have inwardly experienced. The phenomena of «conversion» thus furnished a favorable field for American psychological investigation. Though preceded by monographs and journal articles by other writers of whom G. Stanley Hall and James H. Leuba have remained the most important contributors in this field, the first comprehensive studies to be published in book form were ‘The Psychology of Religion’ by E. D. Starbuck (1900), ‘The Spiritual Life’ by G. A. Coe (1900) and ‘The Varieties of Religious Experience’ by William James (1902). The methods employed in these three pioneer volumes were respectively the questionnaire, the questionnaire supplemented by interviews and experiments chiefly to determine temperament and degree of suggestibility, and the interpretation of startling religious experiences recorded in autobiographical literature. Though these imperfect methods led to mistakes, they were successful in establishing broad general conclusions.

The following principles in regard to conversion may be regarded as now fairly well established. A changed attitude toward religion some time during adolescence is a very common, and in the opinion of most writers a normal, phenomenon. This transition may assume one of at least four types: (1) a state of emotional depression and poignant self-reproach («sense of sin»; «sick soul») followed by a state of elation and joy felt to be an assurance of divine acceptance; (2) a feeling of incompleteness and lack of appreciation of religious beliefs and practices followed by a greater maturity of apprehension and attendant peace and joy and sense of divine presence and favor; (3) a sudden attainment of the last state mentioned without previous depressed feelings of «sin» or «incompleteness» («spontaneous awakening»); (4) a «gradual growth» without conscious transitions, in which a mature appreciation of religion insensibly supplants the more limited intellectual outlook and emotional capabilities of childhood («healthy-mindedness»). All four of these types would now be regarded as cases of «conversion» by most American denominations insisting upon «conversion» as essential for salvation, and this broader denotation will be followed in this article. However, many psychologists restrict «conversion» to the first two types, which are thus set in opposition to «gradual growths» and «spontaneous awakenings.» The two principal factors that determine which of these four types will be experienced by any particular individual are his own temperament and other factors in his personality on the one hand, and on the other, the kind of experience suggested to him by the pressure of his religious *milieu*. Coe has analyzed these factors carefully. The first two types are likely to be experienced by adolescents who expect such transformations, in whose temperaments sensibility rather than intellect is predominant, and who have a tendency to automatisms and passive suggestibility. Among factors that Starbuck has shown to be influential in determining the age of conversion are sex, age of puberty, and period of most rapid growth; and all of these combined with the age of conversion itself have an influence upon the character of the experience, e.g., determining how far distinctly intellectual features will be present. Conversions to religion among adults are rarer, since they involve the reorganization of a mature personality instead of merely the completion of an immature one. When they do occur, they are usually of the first two types. Phenomena similar to all four types of religious conversion have been noted in experiences of a different nature, such as conversions to «infidelity,» «falling in love» and «falling out of love,» sudden changes from prodigality to miserliness, etc. So psychological justification may be found for the popular practice of speaking of a person's «conversion» to a belief, practice or manner of living, whenever a profound change in emotional attitudes and ideals has occurred. The phenomena of conversion are explained in terms of the sub-conscious mind by those who accept that doctrine. Undoubtedly they are instances of the coming to dominance in attention of previously unheeded processes that have been developing in the peripheral consciousness and in the nervous system.

The phenomena of religious revivals are all explained in terms of the well-known laws of imitation and suggestion and crowd psychology of Tarde and Le Bon. (See article on SOCIAL PSYCHOLOGY). The external suggestions of the revival in a few instances precipitate developments that have been incubating in an individual's memory, force them on his attention and effect in his character a transformation that otherwise would have come more slowly or possibly not at all. But the vast majority of revival conversions are «pseudo-conversions,» i.e., behavior induced solely by crowd suggestion to which nothing deepseated in the individual's personality responds, and they are consequently transient in their effects. Often the pseudo-convert loses respect for religion, and in many cases he is injured mentally and morally by the excitement through which he has passed; so religious psychologists as a rule criticise revivalism severely. (Ames; Cutten; Coe; Davenport).

Other religious phenomena that have been investigated by psychologists, though usually with less thoroughness, include mysticism, prayer, saintliness, sanctification, ecstacy, inspiration, faith, visions, mental healing, miracles and witchcraft. None of these involve psychological principles essentially different from those found in conversions and pseudo-conversions. All involve developments that have previously gone on in the organism without having become organized in the personality, so that their more or less abrupt entrance into the focus of attention appears mysterious and is often in consequence assumed to be supernatural. Underhill has found five stages in the experiences of mystics which appear to constitute a repetition of states in some respects analogous to conversions, each however being more profound and comprehensive than its predecessor. This «mystic way,» attended by marvelous visions and other automatisms, is possible only for those who have a talent for this sort of thing, and cultivate it by systematic effort. Strong has found prayer to be «an imaginative social process,» arising in consciousness between an ego and an Alter, and that types of prayer may be distinguished as «ethical» and «æsthetic» as emphasis is laid on the needs of the ego or the glory of the Alter. Psychological studies of some of the great figures in religious history have occasionally appeared; among these the elaborate work upon Jesus Christ by G. Stanley Hall is the most important.

The developments of religious experience in savage races of the present time (which may be assumed to be more similar to primitive mankind than civilized races) and also in the great historical religions have been interpreted from the psychological standpoint. Here the rich data contained in the reports of anthropologists and historians and in sacred literatures have been available for study. Primitive religion has been shown to be more or less closely connected with primitive magic, while its connection with primitive morality is less intimate. Whether religion has evolved from magic, or whether both have evolved from an undifferentiated form of behavior, is in dispute. It is certain that religions always develop within social groups, and that they always attempt to conserve (and also as some think, to enhance and even to create) values that are recognized by groups to be desirable. King and Ames have attempted to state this characteristic of religion in terms of functional psychology. It is now very generally agreed that there is no distinctly religious instinct in the sense that there are instincts of fear, pugnacity, sex, etc. McDougall and others however, believe that certain instinctive emotions, notably fear and wonder, are basic in the evolution of religion. Seashore maintains that there is a peculiarly intimate connection between the play impluse and religion. Wright believes that sentiments toward supernatural beings may on occasion develop from any of the principal primary instincts, but that in any case the religious sentiments rest on instinctive foundations.

Since there is no mental element or process or mode of behavior that is distinctively religious, and so would logically serve to differentiate religion, is it possible to arrive at a definition of religion in psychological terms? Ames, Coe, King and others, looking for a definition of religion in terms of values, regard religion as a process in which values of a distinctively social character are heightened and intensified. Regarding such attempts to define religion wholly in terms of values as vague and unsuccessful, another group of writers believe that religion can be more clearly differentiated through the attitude assumed to the agencies by which the values are believed to be achieved. The agencies, whether fetishes, gods, a single God, or the universe conceived as a spiritual order, or what not, are always non-human entities toward which man assumes the sort of behavior that he ordinarily manifests toward his fellow human beings. (Leuba, Watson, Wright). Similarly, but with more emphasis on beliefs and institutions, Durkheim defines a religion as «a unified system of beliefs and practices relative to sacred things, that is to say, things set apart and forbidden — beliefs and practices which unite into one single moral community called a Church, all those who adhere to them.»

While agreement upon a psychological definition thus has not yet been achieved, it is at any rate generally agreed that religion is mainly an affair of social rather than of purely individual experience; that it is primarily affective and volitional rather than cognitive though it involves all phases of consciousness or behavior to some extent; that it is a process by which the individual assimilates and realizes within himself the values of the social order and achieves a corresponding development of his personality; and that the influence of religions on individuals and societies is at least more likely to be conservative than otherwise. Myths, dogmas, rituals and ecclesiastical organizations, though perhaps fundamental to religion in its maturer phases, are accordingly to be interpreted as mainly products rather than causes of religious activity.

While the psychology of religion professes to be a purely empirical description and explanation of religious experience, its writers have not entirely avoided normative and transcendent problems, though American writers, at least, have endeavored to exclude them from their premises and data, and to introduce them, if at all, merely as deductions from conclusions reached in a strictly scientific manner. Though not itself a normative discipline, the psychology of religion may properly suggest to teachers methods of religious education, and indicate to social reformers and statesmen the possible service and limitations of religion as a factor in social and moral progress, and it may even assist theologians in determining attainable ideals for religious aspiration.

Both those who believe in religion as a revealer of knowledge and those who reject it as a survival from times of superstition have claimed the support of the psychology of religion. Since religious experiences involve an influx into conscious attention from fields outside of personal awareness, much has been made of James' suggestion that this influx may come in part, as it seems to the religious person to come, from a source entirely external to him in the universe that might be called God. Cutten adopts this suggestion, and attributes conversion and other forms of religious experience to «the action of God upon the sub-consciousness.» On the other hand, since the conceptions of the gods are projections of human social experiences and change with changing civilizations, and since all religious phenomena are referable on their psychological sides to individual and social origins which can be analyzed for the purposes of psychology without taking into account the hypothesis of an objective God, it has been argued that atheism — or at least agnosticism — is a necessary deduction from the psychology of religion. It would seem that if the psychology of religion is to maintain its position as a strictly empirical science, its data and conclusions should be kept entirely free from such transcendent questions, as are those of physics and astronomy. Questions concerning the nature and existence of an objective God and other matters of religious faith belong, not to psychology or to any other science, but to metaphysics. They are, to be sure, legitimate metaphysical questions which the philosophy of religion should attack by metaphysical methods, reinterpreting the data of all the sciences, including the psychology of religion, for the purpose. It is even legitimate to combine discussion of psychological and metaphysical problems of religion in a single treatise, and each discipline may be helped by the process. In fact, the science of the psychology of religion got much of its first impetus from the psychological portions of such primarily metaphysical treatises as those of Höffding and Sabatier on the philosophy of religion, and the psychology of religion in turn has contributed much to such metaphysical inquiries as Royce's ‘Problem of Christianity.’ But the psychology of religion is an empirical science, and must adhere consistently to scientific methods of analysis and investigation.

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**RELIGIONS, Congress of.** See Congress of Religion.

**RELIGIOUS ART.** See Christian Architecture; Ecclesiastical Art.

**RELIGIOUS CORPORATIONS.** See Corporations, Legal.

**RELIGIOUS EDUCATION.** The phrase «religious education» began to take on a definite and technical meaning only in the 20th century. Up to that time there is scarcely any trace of its use; to-day it has a recognized place in current educational coinage. Its primary significance is not so much that of instruction in a category of subjects or lessons on religion, but in general it describes that type of education which gives full recognition to the religious nature of the persons being educated, the religious and moral forces operative in their development and the religious, or spiritual, aim of all education. It is the distinctive phrase of the movement which seeks to complete the aims of general education by the inclusion of the elements commonly called religious; these include racial and world heritages of ideals, concepts, interpretations and values of life in terms of the spiritual, training in habits and conduct and the development of motives and purpose in life. It includes and emphasizes instruction in the history and literature of religion as the means of securing the heritage of ideals, but it insists still more on the wider aim of developing the person who will live a life essentially religious, governed by developing spiritual ideals. The concept of religious education has helped to give a deeper meaning to education by calling attention to the spiritual needs of the person. It has given new significance to religious activities by suggesting their educational character and responsibilities. It has made men think of education in terms of the religious ideal and of the religious aim and ideal as realized by educational processes.

The movement for religious education owes its modern inception and its present impetus to the vision of educational idealists such as Herbart, Froebel, Spencer and Dewey who conceived of education in terms of life and as embracing all life, to leaders in the spiritual like Gladden, Coe, King and others, who taught us to think of religion in terms that lift it far above its own records, analyses, philosophy and literature, and to practical educators, like W. R. Harper, who could see the problem of securing to each person his full heritage of the world's spiritual idealism and opportunity. The movement for religious education instead of forcing ecclesiastical formularies upon the schools and colleges has widened the meaning and field of education, and has given it a deep, spiritual meaning. Whether in the agencies of the Church or in those of the State, religion and education are seen as inseparable processes of *life development.*

The notion of religious education expresses the idealism of the modern revolt against formalized education. General education passed from the restraints of a class privilege to become little more than a system of mass, mechanical, intellectual discipline, a formal and largely perfunctory initiation to the rights of citizenship. Its technique was that of mental processes. Its aim was the acquisition of bodies of information arranged in a series of fixed steps which led up and out of schooling. Its tests were almost exclusively intellectual. Its professional interests were largely confined to methods of formal disciplines. But modern psychology revealed the person as a complex of powers; it insisted both on the breadth of the life as embracing much more than the so-called mental powers and on its unity so that every power of the life entered into the making of the person. Moreover modern social studies indicated that the formal, intellectual disciplines of education were failing to train persons competent in vision, motive and habits for the strain and opportunities of present-day living. It became evident that if education would really develop persons it must deal with them as lives and not alone as memories. It must include, by some means, the range of motives, ideals, emotions, the habits and the will and all that determines character and conduct. A new conscience for personality arose in education.

Along with the new conscience in education came new concepts in religion. It passed again into the realm of life. Quickening social responsibility brought religious thinking close to reality; it became concerned with people. It was seen that if its ideals were to be realized it must be through persons intelligently governed by those ideals. Seeking to save society the churches are coming to see a program of growing an ideal society by developing ideal persons, an educational program. The child has come to have a new importance because his life is at its determinative, developing period and because he may be trained to become an effective religious person. One can have religious persons only as such persons are trained; the time to train them is in the developmental periods and the scientific methods of modern education are the truly religious methods of such training.

Further the demand for religious education arose from a quickened public conscience. With a rapidly rising wave of juvenile delinquency it was evident that the young were not being adequately prepared for the elemental duties of living. The general curriculum was much richer than in former times, but it was poorer in that it failed to include the elements that make for strength and ideals in character. The disciplines that failed to include discipline in the art of living were inadequate for the demands of life. In the realm of conduct something is required beyond knowledge; ideals must be developed, the motives formed, the will trained. The realm of judgments, motives, ideals of life and will to live is essentially the realm of religion. Training in these respects is religious training. In meeting the problems rising out of the recognition of the need for such training the schools have been compelled to look to the religious agencies for aid.

Religious education in the United States has received stimulus on account of the relations between the agencies of religion and those of education. The people of the United States are entirely committed to the policy of the separation of Church and State. This involves the separation of the work of the schools from that of the churches. Instruction in religion is the responsibility and privilege of the churches.

The public agencies of education cannot give *formal instruction* in the subjects of religious history, philosophy and methods as such because (1) Such instruction would be "sectarian." It might be Christian in the broadest sense; but nevertheless, this is a land of absolute religious freedom, a land where, within the limits of the civil law, all faiths have equal rights. Public money cannot be legally nor ethically devoted to teaching Christianity as such. (2) Such instruction, if attempted by the public schools, could never be satisfactory to the religious agencies. It would be sure in some instances to run counter to cherished beliefs. Nor is it possible to agree in the schools on a common creed. Even in the churches all attempts to agree on a common creed have resulted in such a planing away of the parts as to leave nothing at all. Even though the creed were reduced to the briefest, barest possible terms, the objection would still hold that such a creed, formulated for the public schools, would be the creed of the schools, and they would become creedal institutions. (3) The teaching of religion in any such a formal manner and even in any so innocent a form of matter would be an invasion of the peculiar privilege of the churches. (4) Formal religious teaching in these schools would not attain the object desired; it would result, as the German system has resulted, in the formalization of religion until it is destitute of practical, vital meaning to the child. (5) Sectarian teaching means sectarian interference. Under the paralyzing effect of denominational oversight, of fear of offending on this hand and that, the teacher would be without the freedom of life and the teaching without direct character values. (6) Public school teachers are neither trained nor selected for the work of teaching religion.

With such a situation in every community there has fallen on the religious agencies the burden of the instruction of children in the subjects of religion. That task was, for 10 decades, relegated to the *Sunday school.* But rising educational standards indicated the inadequacy of this school with its brief weekly period, its corps of purely amateur and untrained teachers and its lack of any sort of physical equipment. It lacked professional leaders, educational ideals and standards of work. It was expected to accomplish specific instruction in religion when it lacked educational standing and consciousness. In fact it had no plan of instruction in its own field, in religion, as it attempted no more than perfunctory instruction in certain parts of the Bible. Along with the revival in educational science came a quickening of scientific interest in religion, especially in its literature and its phenomena. The churches had laid upon them a difficult task, to meet the demands of this new interest, to furnish instruction which could meet modern, prevalent, scientific concepts and to meet the need for religious instruction of the young with plan and plant recognized as totally inadequate and inefficient. Leaders in the different churches began to see the seriousness of the educational need; they began to seek for religious educational leadership. They found it through the work of the Religious Education Association. (See RELIGIOUS EDUCATION ASSOCIATION). Before long there developed leaders who began to interpret the work of religion in educational terms.

The development of religious education in the *churches* has been marked by: (1) The educational reorganization of schemes of instruction. The Sunday school has become, in many instances, a real school. Courses of study are now provided, in a variety of forms, for as many as 20 different grades, from the youngest to the adults in a school. The material includes religious history, teachings and ideals both in the Bible and outside, ancient and modern problems of present-day living and social organization. At least 250 textbooks are available, nearly all having been prepared since 1903. This elaboration of curricula has taken place in practically every Church communion, including the Roman Catholic, the Hebrew and the Mormon. It brought about the complete reorganization of the International Sunday School Lesson Committee which formerly prepared one single lesson for all scholars in all Protestant schools; a new committee prepares schemes of graded lessons, a different lesson for each year of the pupil's life. (Consult Cope, H. F., 'The Modern Sunday School and its Present Day Task; also Athearn, W. S., 'The Church School'). (2) The provision of suitable facilities for the work of instruction in religion. A very large number of churches now provide special buildings for their general educational work. There have classrooms with regular equipment, often gymnasiums, and facilities for play, recreational and social activities. (Consult Evans, H. F., 'The Sunday School Building and Its Equipment'; also Cope, H. F., «The School in The Modern Church»). (3) The development of professional leaders in religious education, especially for the organization and direction of work with the young. Leadership is passing from the amateur to the trained expert. Hundreds of churches are employing persons who have been trained in special courses in psychology, pedagogy and educational method as superintendents of church educational work, including Sunday schools and as teachers. The Religious Education Association established a professional standard and lists nearly 200 persons as «Directors of Religious Education in Churches.» These all have had several years of graduate study of a technical character. A special organization of directors exists. (Consult *Religious Education,* April 1914, p. 186; Oct. 1915, p. 444). (4) The Church communions have provided specialized leadership in religious education by organizing what are known as commissions on religious education. Among the more active and important commissions are those of the following churches: Episcopal, Secretary Wm. E. Gardner, New York; Baptist, Secretary Prof. E. DeWitt Burton, Chicago; Congregational, Secretary Rev. F. M. Sheldon, Boston; Presbyterian in Canada, Secretary Rev. J. C. Robertson, Toronto; Disciples, Secretary R. M. Hopkins, Cincinnati; Methodist, Secretary Dr. Edgar Blake, Chicago. The commissions outline advanced plans of religious education in churches, communities and families. The official denominational organizations are also federated in what is known as the Sunday School Council of Evangelical Denominations for the common supervision of the work of this group of churches in this field. This body has effected a common organization with the International Sunday School Association for the promotion and supervision of work in this field. The Federal Council of Churches also has a commission on religious education. (5) The special preparation of ministers of churches for religious educational work. In 1903 the Hartford School of Religious Pedagogy was organized. In 1906 a chair of Sunday school pedagogy was established in the Southern Baptist Theological Seminary. In 1912 50 theological seminaries made provision for one or more courses training ministers for educational work in the churches, 10 of the seminaries having chairs in religious education. In 1919 all the larger seminaries provided such courses and many colleges were offering work in religious education both as preparatory to theological seminary courses and for layman.

**In Relation to Public Education.**—The recognized necessity for courses of instruction in religion available to all school children led to the organization of a field in which both the churches and the public schools could operate without official relations under what is known as the plan of correlated Bible study. In 1910 an arrangement was made by which students at the Colorado State Teachers' College, Greeley, Colo., could receive not to exceed two units of credit for the study of the Bible outside of the college in church classes under academic regulations. Later this plan was extended to apply to students in high schools through the State. In 1912 a somewhat like plan was adopted in North Dakota by the State Teachers' Association. It provides that high school students may follow an official syllabus of Bible study and upon passing an examination conducted by the State Teachers' Association receive not to exceed one-fourth of a unit of credit per annum. Several plans are now in operation in a number of the States. A further and different development has taken place, beginning at Gary, Ind., by which children in the public schools may be excused at certain periods in order to attend classes conducted according to schoolroom standards in their churches and this without prejudice to their standing in the public school. None of these plans call for the use of either the property, the funds, the authority or the professional workers of the schools as such. Care is constantly exercised so that there is no sort of official relation between the churches and the State, but the plans have resulted in very much larger numbers of young people receiving regular and systematic instruction in their different churches and Sunday schools, instruction which has been correlated to their week-day work. Similar plans are followed in Toledo, Ohio, Birmingham, Ala., and in numerous lesser communities in Illinois, Indiana, Oregon, Montana and elsewhere. In New York City an influential interdenominational committee promotes the instruction, on week-days, of thousands of children in Hebrew, Catholic and Protestant churches. The Daily Vacation Public School Movement adopted by many church communions provides for week-day religious instructions during the summer period. The fact remains, however, that there are probably 70,000,000 of persons of school age in the United States who are receiving no formal instruction in religion.

**In the Family.**— The problem of the religious instruction of children has been peculiarly complicated in the United States by the fact that, while the public schools have been necessarily debarred from this work, the breakdown of family customs due to settlement in a new country has largely deprived the family of its function in regard to religion. Changing social and economic conditions have effected a similar result so that it is not possible to count on any general custom of instruction in religion in family life nor on any effective degree of religious training in habits and ideals. Doubtless some awakening has been effected. Several organizations have given serious attention to the problem of religious education in the home, notably the Religious Education Association which held a convention on the subject in 1911 and has published much useful material on the problems involved. Other organizations touching the matter are The Mother's Congress, Philadelphia; L'Unione Familiale, Paris; League for the Popularization of Pedagogy for Families, Brussels, publishing up to the outbreak of the war *Educatione Familiale;* the Home Progress Society, Cambridge, Mass.; After School Club, Philadelphia. The impressive Child Welfare Exhibits also aided in calling attention to this need. Consult Hodges, George, ‹The Training of Children in Religion›; Cope, Henry F., ‹Religious Education in the Family.›

**In Communities.**— In 1917 serious attention for the first time was paid to the possibility of organizing a system of religious instruction which, while remaining independent of taxation and upon a voluntary basis, should parallel the system of public instruction. It was realized that the current plan of separate schools in churches, meeting only once a week and for a brief period, was entirely inadequate and highly wasteful. The International Sunday School Association proposed a plan of schools created by community boards of religious education and quite independent of churches. The plan attracted wide attention; but it met with much opposition and little practical support, principally because of the proposed divorce from church control. However, numerous experiments were made in the organization of communities for the training of religious teachers and much serious attention continues to be given to the possibilities of common, united action, for it is relized that the largest possible contribution to a united religious life would be to give to all children a common, unified training in religion. Consult Cope, Henry F., ‹The School in the Modern Church›; Winchester, A. S., ‹Religious Education and Democracy.›

**In Relation to Public Schools.**— Even with its recognized limitations the public schools have not been indifferent to the child's needs for religious education. The voluntary organization of public educators, the National Education Association, has declared in formal resolutions «The building of character is the real aim of the schools» (Resolutions of 1905 and similar statements in conventions of 1910 and 1911). In current literature on general education of children there is clear recognition of the fundamental place of training in motives and habits of conduct. The notion of «dealing with persons as behaving organisms» (Bagley in ‹Educational Values›) and «the aim of social efficiency» (Dewey in ‹My Educational Creed›) are characteristic of the thinking of leading authorities. The Religious Education Association organized several important conferences of public school leaders on different phases of moral training in the schools and in 1916 conducted an important convention in Chicago on the relations of religious instruction to public education, discussing particularly the various schemes of correlation between the work of instruction in religion in churches and the work of public schools. In 1915 the National Education Association offered a prize for the best essay on the place of religion in education and a scheme for religious instruction in public schools. On the other hand the Religious Education Association has steadily refused to endorse plans for religious teaching in public agencies and has sought to develop the voluntary agencies to efficiency in this field.

**Activities in the Colleges and Universities.**— The problems of teaching religion and imparting religious training in *colleges and universities* have not been neglected in recent years. Numerous colleges have introduced new courses, engaged new and highly trained instructors in the Bible and other aspects of religion and generally, in almost all colleges, this work has been brought up to a higher academic level. More men and women of thorough training are engaged in teaching religion in this field than ever before. They have a special professional organization of their own in the college department of the Religious Education Association. Besides courses in the Bible there began to be introduced in the American colleges, in about 1908, courses in religious education, courses designed to train young people to usefulness in the organization and teaching in religious agencies. In 1919 there were over 200 standard colleges offering courses in this field, looking forward to the usefulness of the graduates in work in religious education, especially training teachers and specialists in this field. In State universities, separated from ecclesiasticism just as public schools are, there is, however, greater freedom in the teaching of religion because here it is lifted into a higher realm of free discussion and of pure scientific thought. Some State universities offer courses in religious literature, nearly all in the history of religions, some in philosophy and psychology of religion and some provide for courses in religion given in accredited institutions adjacent to the university. The real problem of all institutions of higher learning as it relates to religious education is not, however, so much in the realm of formal courses in religion as in the matter of securing in the institution the prevalence of ideals, the rule of customs and atmosphere that will train the students in habits of religious living, and will inerpret life to them in essentially religious terms. In many universities this is consciously the most serious endeavor, to send out men and women to whom life means a chance to realize high spiritual ideals.

In an increasing degree the phrase religious education is coming to mean to large numbers of persons the interpretation of every activity and aim in life in terms of character results, to see all as judged by the effects on persons, by the product in character and in the permanent worths of life. It has come to mean a new interpretation of religion as not alone a body of literature or philosophy, and still less a form of organization or custom, but as a force of ideals working in life to develop finer persons, to interpret the world in the light of the values that endure, the values of thought, ideal and hope. Religious education seeks to organize society, through all agencies of instruction, habituation and idealization, so that out of all the process of life there may grow religious persons and there may develop a society that will make a religious world.

Henry F. Cope,
*General Secretary of the Religious Education Association; Author of 'Religious Education in the Family,' etc.*

**RELIGIOUS EDUCATION ASSOCIATION, The,** was organized in February 1903 at a convention called to consider «the improvement of moral and religious education.» The movement began under the inspiration of William Rainey Harper, then president of the University of Chicago, who organized a «Council of Seventy,» first to promote modern, scientific biblical study and, later, to develop the necessary organization for promoting religious education. Other well-known educators associated with the beginnings of the organization were Dr. Charles Cuthbert Hall, Dr. Frank Knight Sanders, Dean Shailer Mathews, Pres. William Douglas Mackenzie, Pres. James B. Angell, Prof. John Dewey, Dr. William Hervey and Pres. Henry Churchill King. The organization states its purpose as: «To inspire the educational forces of our country with the religious ideal; to inspire the religious forces of our country with the educational ideal; and to keep before the public mind the ideal of Religious Education and the sense of its need and value.»

It brings together in one comprehensive organization the leaders and workers of all ecclesiastical, evangelical, educational, cultural and social organizations who wish for fellowship, for mutual interchange of thought, information and experience, and for co-operation in achieving the highest ideal of personality and citizenship. By means of this organization of leaders, it promotes the interrelation of all existing agencies of religious and moral education, for mutual service, understanding and sympathy, for economy of effort, for friendly co-operation and for united strength. It also surveys the whole field of religious and moral education, promoting a study of conditions, reporting the organized and individual forces at work within it, fostering thought, discussion and experiment, determining the principles and the methods of progress.

It enlists in a united membership and fellowship of service all persons, in all walks of life, who desire to secure the improvement of homes, churches, schools and other agencies in the work of moral and religious instruction and training.

The Religious Education Association has a membership of 3,000 persons paying the annual fee of $3; the money necessary for its extension work and its free services to persons seeking counsel is contributed by other members who elect to pay $5, $10 and upward, and by persons who make generous gifts to this work.

The Association conducts a *bureau of information* to meet the need for a common source of reliable information on modern work in religious education. Through its officers it gathers up the facts on modern methods from all parts of the world. This information is classified in the office and constitutes, with the extensive library, the working basis with which to answer thousand of inquiries annually.

The central office acts as a *clearing-house* on methods, material, literature and information. All inquiries receive careful attention and are answered by the aid of department officers and specialists and the exhibit library. Whenever literature on the subject of inquiry is available it is sent to inquirers. Numerous pamphlets, bibliographies, reprints, etc., are on hand for free distribution. The services of the bureau of information are free to all.

The bureau also aids many inquirers personally. The offices are open to the public, and at the headquarters of the Association, at 1440 East Fifty-seventh street, Chicago, a permanent exhibit of materials has been installed. This exhibit now consist of: (1) A library of over 6,000 books, consisting of works on methods, principles and materials of religious and moral education. The textbook selection shows the material now available for use in Sunday

schools, colleges, etc. (2) Lesson helps, text-books, outline material and printed matter used in Sunday schools and similar institutions, intended to reflect the best material and methods. (3) Pamphlets and illustrative material on moral education.

The Association holds annually an international convention. These conventions, to which the public is invited, but at which members have special privileges, already have an international fame for their splendid array of noted speakers, the importance of the topics discussed and the character of the attendance. Each convention program includes over 100 speakers and 30 different meetings.

The membership of the Association is divided into departments which are organized about institutional interests for co-operative study of their problems and the improvement of their methods of religious education, by correspondence and conference, especially at the conventions, enlisting the services of many leaders and specialists. The Association has published five large volumes, containing authoritative, modern scientific treatment of the most important problems of the home, Sunday school, public school, college, university, church, library and other educational agencies, and it also issues the bi-monthly magazine, *Religious Education.*

**RELIGIOUS LIBERTY.** See Liberty, Religious.

**RELIGIOUS ORDERS.** See Orders, Religious.

**RELIGIOUS PAINTINGS.** See Paintings of the Great Masters.

**RELIGIOUS SECTS.** From the earliest days of the world's history man has been more or less a religious creature. Almost invariably he has had a god, or several of them, to whom he looked for protection. At times these gods have been crude fetishes of whittled wood or roughly hewn stone; at times they have assumed the form of animals or reptiles, or have appeared as cruel monsters eager for the life-blood of those who reverenced them. But, however they may have come, man has worshipped them, because religion, as represented in the worship of a supernatural power, is interwoven with the entire fabric of human nature. The religious «sect,» however, is of more recent origin, for while primitive man could worship his crude fetishes blindly, it was necessary that he should learn to think before he could attempt to distinguish between the various attributes of the Infinite, that from them he might construct those well-marked divisions of faith, or creed, which are such an inevitable result of the varying phases of human thought. To-day the term «sect» is applied to those bodies of men who have announced their decisions to follow the opinions or doctrines of some philosophical or theological teacher. Of course, to the Roman Catholic all religious bodies that are not actually in affiliation with her communion are classed as sectarian, but such a definition is not the general one, the word «sect» being used to differentiate separate organizations rather than to call attention to comparatively inconsequential differences of opinion. Thus, for example, the High and Low Church factions in the Church of England, or, in this country, the Protestant Episcopal Church, are not regarded as separate sects but as parties, or schools, within the same communion; whereas the various bodies of Baptists in America are denominated as «sects,» not so much because of their differences in doctrinal matters, which in some instances are slight, but for the reason that they are under separate Church government. While there were sects among the ancient Jews and Greeks the coming of Christianity, with its wide field for speculation, opened the way for a more general promulgation of individual opinion and the following list of the most important organizations of this and other days indicates that there has been no lack of teachers and prophets to preach new gospels to those who would hear:

Abecedarians.— A sect of German Anabaptists, led by Nicholas Stork, a weaver, who opposed the simplest forms of education, even the learning of the A B C's, on the ground that it prevented divine illumination and hindered spiritual sanctification. Extinct.

Abelites.— An African sect which opposed procreation on the ground that it was a perpetuation of sin. Extinct.

Abrahamites.— An obscure Bohemian sect of deists. Its members rejected all distinctively Christian doctrine, with the exception of the Lord's Prayer, which they used, adopting the tenets of the religion of Abraham as contained in the Decalogue. Extinct.

Abyssinian Church.— That branch of the Christian Church that has been established in Abyssinia for many centuries. It is in agreement with the Coptic Church concerning its ritual and practice, but differs from it slightly in its theological position.

Acacians.— An Arian sect which occupied a theological position half way between the Semi-Arian and the extreme Arian, or Anomœan sects. Extinct.

Adamites.— Several attempts have been made to revive the sect of Adamites, which was first suppressed in the 2d century. Its pretensions are that its members have attained the primitive purity of Adam and are, therefore, able to dispense with marriage and to go without clothing at their meetings, which are called " paradises." Upon each appearance it has been proscribed, the last attempt at rejuvenation having been in 1848–49.

Adelphians.— A branch of the Euchite sect. Extinct.

Admonitionists.— The followers of Thomas Cartwright, who, in 1572, advocated the government of churches by presbyters instead of bishops and who urged the right of the Church to hold supremacy over the state. Extinct.

Advent Christian.— The largest branch of Adventists. Absolutely millennial in character, it teaches the final extinction of all evil as well as the renewal of the earth that it may become the future abode of the saints. See Adventists.

Aerians.— A reforming sect in the 4th century now sometimes considered to have been a forerunner of modern Presbyterianism. The members declined to permit prayers for the dead, repudiated the Church fasts, and made the authority of the presbyters equal to that of the bishop. Extinct.

Age-to-Come Adventists.— One of the many sects of Adventists. Its members believe that at the time of the millennium Christ will assume a personal rather than a spiritual rule over the earth which, they hold, will not be destroyed at the Second Coming. See Adventists.

Agnostics.— While unorganized as a sect agnosticism teaches the theory that it is impossible for man to attain to any definite knowledge of the divine power.

Aitkenites.— A party which was founded in the Church of England about the year 1850, by Robert Aitkens, a ritualistic clergyman. It was an attempt to graft a portion of the tenets of Methodism upon the High Church school of ritualistic and sacerdotal theology.

Albaneses.— A mediæval sect closely allied to the Albigenses. Extinct.

Albigenses.— A name applied to the anti-sacerdotal sects that revolted from the Church of Rome during the 12th century. They were vigorously persecuted and finally exterminated.

Allenites.— The followers of Henry Allen, who preached the peculiar doctrine that all souls were actually present at the Garden of Eden where they participated in the fall of Adam. Extinct.

Alogians.— A name applied to a heretical sect of the 2d century because of its rejection of the doctrine of the Logos and the Gospel of Saint John.

Amalricianism.— A pantheistic heresy promulgated by Amalric of Bène, professor of logic and exegesis in the University of Paris. Extinct.

Amyraldists.— A sect of Calvinists who followed Moses Amyraut in his attempt to reconcile the disputes concerning predestination and divine grace.

Anabaptists.— A name most generally applied to those bodies of extreme anti-sacerdotalists which required rebaptism from those who had been baptized in infancy and who were often over-zealous in their repudiation of certain doctrines of the 16th century Church. For many years the term was seldom used except as one of opprobrium.

Angel Dancers.— A small sect of vegetarians founded about 1890 by Huntsman T. Mason, who claimed to be the reincarnation of the spirit of Saint John the Baptist.

Angelic Brothers.— A community of Dutch pietists founded by George Gichtel in the 16th century. Its members held that, having attained a state of angelic purity, they should give no further thought to marriage. Extinct.

Anglicans.— One definition for the High Church school in the Episcopal Church.

Annihilationists.— The name applied to those sects which teach the absolute destruction of the wicked.

Anomæans.— The extreme sect of Arians; it taught that the Son was of an essence which was not even similar to that of the Father. It existed during the 4th century.

Ansarians.— A sect whose membership is almost entirely restricted to a small district in Syria. As a religious belief it is a combination of Mohammedanism, paganism and something that somewhat resembles Christianity. This strange faith is said to have first been taught by Nusari, a prophet and saint who lived at Nasai, near Koufa, in the latter part of the 9th century, and his gospel included the doctrine of metempsychosis as well as that of divine unity in three personalities, the second and third being created. This sect now receives both the Old and New Testaments, the Koran and several apocryphal works as its inspired scriptures.

Anti-Mission Baptists.— A sect which is theologically in accord with the regular Baptists but that is opposed to missions, Sunday schools and other educational and evangelistic enterprises.

Anti-Pædabaptists.— A name sometimes applied to sects that are opposed to the doctrine of infant baptism.

Antiburghers.— A name applied to one of the two factions into which the Scottish Secession Church was split in 1747. The controversy was based upon the lawfulness of a clause in the oath required to be taken by burgesses, but, while the point was fiercely contended for several years, the two factions were reunited in 1820.

Aphthartodocetæ.— A sect which became extinct about the 9th century. It held that the body of Christ was incorruptible even before the resurrection and that his suffering of death was merely a phantasma.

Apollinarians.— A sect condemned during the 4th century for having denied the proper humility of Christ.

Arians.— The followers of Arius, the Alexandrian priest who promulgated a widespread heresy during the 4th century. Denying the divinity of Christ and other fundamental doctrines of the Christian Church, he was condemned and Arianism was suppressed by order of the early councils. Since that time, however, the doctrines taught by Arius have been frequently revived and they still exist under other designations.

Armenians.— Although the separation of the Armenian Church from the main body of Christians, which occurred at the time of the Council of Chalcedon (451 A.D.), was the result of a comparatively inconsequential misunderstanding; it has been maintained to this day, in spite of the several attempts at reconciliation.

Arminians.— A name sometimes applied to the anti-Calvinistic sects of Protestants which teach the doctrine of universal salvation.

Artotyrites.— A sect existing in the early days of the Church. It admitted women both to the priesthood and the episcopate and taught the use of bread and cheese in the eucharist on the ground that it was right that man's oblations should be of the fruits of the earth and of the flocks.

Atheists.— The term applied to those persons who deny the existence of God.

Baanites.— A Paulician sect of the 8th and 9th centuries. Extinct.

Babists.— The followers of Mirza Ali Muhammad of Shiraz, who founded a new religious system in Persia during 1844. Described as a "Pantheistic offshoot from Mohammedanism, tinctured with Gnostic, Jewish and Buddhistic ideas," the high form of morality which it teaches has appealed so strongly to the Western mind that its converts in America alone during the past few years undoubtedly number several thousand. Among other doctrines Babism teaches the equality of the sexes.

Bahaists.— The same sect as the Babists (q. v.).

Baptists.— Those sects which oppose infant baptism, administering the rite only to adult persons, and then baptizing them not to make them children of God, but as a sign that they themselves have accepted Him. See Baptists.

Beguni.— A fanatical Russian sect which preaches and, it is feared, sometimes practises the rite of human sacrifice as a means of justification before God.

Bezopoftschins.— Many sects of Russian dissenters depend upon an independent ministry, rejecting the office of priest, or "pope." They are designated as Bezopoftschins.

Bible Christians. See Bryanites in this article.

Bohemian Brethren.— A Hussite sect which was quite numerous in Bohemia but which ceased to exist at the end of the 17th century.

Booldo.— The Buddhism of Korea, which differs but slightly from that of China.

Borrelists.— A sect of Mennonites whose worship is devoid of all external ordinances.

Bourignonists.— A sect of Quietists founded by Antoinette Bourignon, a pietist who claimed to be the subject of divine inspiration, in the 17th century. Extinct.

Brahmanism, or Hinduism.— This religion, which is the oldest faith that has sprung from the Aryan family, derives its name from that of its chief caste, from which alone, the priests are selected.

Brahmo-Somaj.— A monotheistic Hindu sect which apparently owes its origin to the contact of Brahmanism with the various anti-sacerdotal forms of Christianity represented by the missionaries.

Broad Churchmen.— A designation often applied to a school of thought in the Protestant Episcopal Church, the members of which are inclined to give considerable latitude to individual opinion in the rejection or acceptance of beliefs.

Bryanites.— Otherwise known as "Bible Christians." A sect which is in general theological accord with Methodism, but which permits women to preach.

Buchanites.— The followers of Elspeth Buchan, or Simpson, a religious enthusiast in Scotland who claimed to be the woman of Revelation in whom the light of God was restored to men. Extinct.

Buddhism.— The reform movement which originated in India, some 2,500 years ago. It was a protest against the religious and social despotism of Brahmanism, and, while atheistic in theory, teaching that release from existence, or absorption into the infinite, is the great good to which man should look forward, it has exercised an elevating effect upon the social and moral conditions of the countries where it has been accepted. It is still the religious faith of about one-third of the human race.

Cainites.— A fanatical Gnostic sect of the 2d century. Its members reverenced such personages as Cain, Esau and Judas Iscariot. Extinct.

Calendar Brethren.— A religious society, which, while once prominent, now exists only in Brunswick. It derives its name from the fact that its meetings are always held on the Kalends, or the first day of the month.

Calvinists.— A designation applied to those Christians, in various sects, who follow John Calvin in his opinions regarding the ministry, the sacraments and divine grace, as exploited in his doctrines of "Election" and "Particular Redemption."

Campbellites.— The followers of Rev. John McLeod Campbell, who taught the universality of the atonement and who held that Christ's death was in no sense a vicarious satisfaction of divine justice. He was condemned as a heretic by the Presbytery of Dumbarton in 1830.

Campbellites, American.— Otherwise known as Disciples of Christ, or as Reformed Baptists. A Baptist sect founded by Rev. Thomas Campbell. Congregational in discipline it insists upon baptism by immersion as the requirement for admission to its membership. See Christ, Disciples of.

Catholic Apostolic Church. See Irvingites.

Christadelphians.— Otherwise known as Christ's Brethren. A sect of modern origin which has assumed its name to distinguish it from other bodies of Christians whom it regards as apostates. Quite similar to Unitarianism in its doctrines it still insists upon baptism by immersion. See Christadelphians.

Christian Catholic Church. See Dowie.

Christian Connection.— A sect which accepts no earthly leaders and which denies the inspiration of all creeds. Its members are permitted to be guided entirely by individual interpretation of the Holy Bible.

Christian Israelites.— A small sect, the members of which are anticipating the immediate second-coming of Christ.

Christian Scientists.— The followers of Mrs. Mary Baker Eddy, who, about 1866, promulgated a system of theosophic and therapeutic doctrine. Mrs. Eddy, in her book, "Science and Health," based her theories upon the Bible, teaching that as man's essential nature is spiritual and the Spirit of God, Love and Good, any moral and physical evil must be contrary to that Spirit, representing the absence of the True Spirit which was in Jesus Christ. See Christian Science.

Christians.— Several small sects have from time to time assumed the title "Christians," to indicate that they alone are possessed of true Christianity.

Christ's Brethren. See Christadelphians.

Christ's Sacrum.— A religious society founded in the 18th century to work for the reunion of all Christian bodies. Practically extinct.

**Church of God.**— Otherwise known as Winebrennerians. A small body of Baptist Christians, which accepts no authority, or creed, except that contained in the doctrines exploited by its founder, John Winebrenner. See Church of God.

**Church of God in Jesus Christ.** See Adventists.

**Church of the New Jerusalem.** See Church of the New Jerusalem.

**Coglers.**— A sect of total abstainers whose chief tenet is that its members are morally incapable of committing any sin.

**Collegiants.**— A sect which, founded in the 17th century, is still well represented in The Netherlands and in some parts of Germany, deriving its name from the fact that its assemblies are known as colleges. Its theological position is practically that of the Quakers, plus baptism by immersion.

**Collegiate Church.**— The corporate name of a branch of the Reformed (Dutch) Church which occupies an important position among the religious bodies of New York.

**Confucianism.**— Although one of the popular religions of China, Confucianism is in no sense a religious system, its only worship being what may be defined as a religious veneration of ancestors. Instead of doctrines it presents instructions as to the proper mode of life, the discrimination between virtue and vice; the duty of compliance with the law of following the dictates of the conscience, etc.

**Congregationalists.**— An evangelical sect which derives its name from its fundamental principle in discipline, that each particular congregation is an independent body, having the right to elect or depose its pastors, settle all disputes regarding matters of faith; and exercise necessary discipline over its members without the interference of other congregations.

**Copts.**— The name applied to the Jacobite Church in Egypt, which has now almost entirely supplanted the Orthodox Church.

**Cumberland Presbyterians.**— A sect which withdrew from the Presbyterian Church in 1810 because of the refusal of that body to recognize as ministers persons who had been admitted without the usual educational preparation and who refused to subscribe to the Calvinistic doctrine of "Election." See Presbyterian Church.

**Deists.**— Those who believe in the existence of God, but who accept few if any other of the doctrines of the Christian religion.

**Devil Worshippers.** See Satanists and Yezeedees in this article.

**Donatists.**— An early Christian sect in Africa. Its members held that they alone constituted the true church and that any offices performed by other clergy were invalid. Extinct.

**Dowieites.**— Otherwise known as "The Christian Catholic Church." A sect primitive in creed, the members of which believe in the healing of disease by prayer. It was founded about 1892 by the late John Alexander Dowie, who professed to be the reincarnation of the Prophet Elijah.

**Druses.**— A fanatical sect found chiefly in the mountainous regions of Syria. Their name is derived from that of their first apostle, Ismail Darazi, or Durzi. Little is known concerning their belief, their reputation for fanaticism being based upon the blood feud which tney have long maintained against their Maronite neighbors.

**Dukhobortzi.**— A Russian sect which originated in the early part of the 18th century. It has been subjected to repeated persecutions both because of its religious doctrines and for the refusal of its members to abide by the laws of the country.

**Dunkards.**— Otherwise known as Brethren. An American sect of extremely primitive Baptists which was founded by a party of German emigrants in the 18th century. In addition to a dress which is peculiar to themselves, its members maintain such customs as the washing of feet and the anointing of the sick with oil. See German Baptist Brethren.

**Ebionites.**— A sect of Judaizing Christians which became extinct about the 4th century. They recognized Christ as the Messiah, but denied his divinity and repudiated the writings of the apostles, accepting the Mosaic law.

**Elcesaites.**— A Jewish Christian sect very similar in doctrine and practice to the Ebionites. Extinct.

**Encratites.**— The name applied to those members of Early Church who refrained from marriage as well as the use of wine and flesh meat. Extinct.

**Enochites.**— A millenarian sect in Russia. It teaches that the Prophet Enoch has already returned to earth and that his personal manifestation will be the signal for the destruction of all matter.

**Ensarians.** See Ansarians in this article.

**Erastians.**— The followers of Thomas Erastus, who proposed several restrictions regarding the jurisdiction of the Church. Extinct.

**Euchites.**—A 4th century sect sometimes known as Euthusiasts. Its members lived a life of prayer and asceticism and repudiated the sacraments and moral law. Extinct.

**Eunomians.**— A sect of extreme Arians. Extinct.

**Eusebians.**— The followers of Eusebius of Nicomedia, who effected the restoration of Arius in 334. Extinct.

**Eustathians.**— The orthodox sect in Antioch during the 4th century. Extinct.

**Eutychians.**— The members of a sect condemned for heresy in the 5th century. They taught that Christ was possessed only of a divine nature. Extinct.

**Evangelical Adventists.**— The original sects of Adventism. Its particular belief is in the conscious state of the dead and, necessarily, the conscious suffering of the wicked. Like other Advent sects it is millenarian. See Adventists.

**Evangelical Association.**— A sect whose belief is like that of the Methodists except that it rejects the doctrine of original sin. See Evangelical Association.

**Evangelicals.**— A designation sometimes applied to the Low Church party in the Episcopal Church.

**Fetishism.**— The lowest grade of idolatry, taking the form of a worship of some material object to which a supernatural power is ascribed.

**Fire Worshippers.**— A designation by which the Parsees are sometimes known.

**Flagellants.**— The victims of a hysterical mania which spread over almost every portion of Europe during the Middle Ages. Its devotees held that in flagellation was the only means to salvation, but their use of the scourge was finally suppressed by the ecclesiastical powers.

**Flemings.**— Otherwise known as "Fine," or rigid Mennonites, because they profess to maintain more ancient rites and stricter principles than those followed by ordinary Mennonites. Among these ancient rites is that of feet washing.

**Foism.**— The official name for the Buddhism of China. Its worship includes that of many gods which are peculiar to itself.

**Fratricelli.**— A sect which had its origin in a reformation of the Franciscan order in the 13th century. Its members devoted themselves to prayer, rejected the sacraments and held that the ideal Christian condition was one of poverty. Extinct.

**Free Church of England.**— A name which has been assumed at various times by sects which have seceded from the Church of England. They have had no affiliation, however, either in principles or practice.

**Free Kirk of Scotland.**— A name assumed by that body of Presbyterians which seceded from the Established Church of Scotland in 1843. The only points in which it differs from the older body are in matters of patronage and the question of the right of the state to interfere in church affairs.

**Free Will Baptists.**— A sect which withdrew from the Baptist communion in 1780, chiefly because of its rejection of the Calvinistic doctrine of election, but a much closer union between these two sects has since been effected, many churches in various parts of the country having united.

**Friends, Society of.** See Friends, The Religious Society of.

**Friends of Light.**— A sect of Rationalistic Lutherans. It taught that complete intellectual freedom in religious belief could not be obtained except when individual judgment was permitted to be the sole guide of the conscience.

**Galenists.**— A Mennonite sect founded in 1664 as the Arminian branch of the Waterlands.

**Glassites.** See Sandermanians in this article.

**Gnostics.**— The name applied to the Rationalistic sects which flourished between the 2d and the 6th centuries. They rejected the literal translation of the Scriptures, held that God was unknowable, that Christ was a superior æon who had come to subdue the æon of this world, and insisted that knowledge instead of faith was necessary to salvation. Extinct.

**Greek Orthodox Church.**— The name applied to the communion which since its separation from Rome has acknowledged the primacy of the patriarch of Constantinople.

**Gymnosophists.**— An ascetical sect of Hindu philosophers who lived as hermits that they might better devote themselves to silent contemplation. Extinct.

**Hanafites.**— The oldest of the four orthodox sects of Sunnite Mohammedans.

**Harmony Society.**— A communistic religious body composed of members of the German Pietist sect, the Separatists, which emigrated to the United States in 1803 and founded a colony in Pennsylvania, the model for which was the primitive church. After removing to Indiana in 1815, they returned to Pennsylvania in 1825, when they founded the township of Economy and the new village of Harmony. Communistic in character, they hold all property in common, discourage matrimony, and look for the early second-coming of Christ. See Harmonists.

**Hattemists.**— A sect founded in The Netherlands in the 17th century. Its members denied the expiatory sacrifice of Christ and held that sin can exist only in the imagination. Extinct.

**Henricians.**— A sect of religious reformers that originated in Switzerland during the 12th century. Extinct.

**Heracleonites.**— A Gnostic sect of the 2d century. Extinct.

**Hicksites.**— Those who followed Elias Hicks in his separation from the main body of the Society of Friends in 1827. They deny the divinity of Christ and repudiate the doctrines of the Atonement and the Trinity.

**High Churchmen.**— Otherwise known as Ritualists. A designation applied to those members of the Episcopal Church who exalt the authority of the Church and give prominence to the sacerdotal aspect of the priestly office.

**Hinduism.**— The name applied to the modern religious beliefs which have developed from Brahmanism.

**Holy Ghost and Us, Society of the.**— Otherwise known as "The Church of the Living God." A sect which, millennial in character, teaches the cure of disease by faith and professes to follow a literal interpretation of the Scriptures.

**Holy Rollers.**— A designation applied to a small sect because of the peculiar habits of its members who roll upon the ground during their religious ecstasies.

**House of Israel.**— An obscure sect of American millenarians.

**Huntingdonians.**— A sect of Calvinistic Methodists, congregational in policy, which was founded by Selina, Countess of Huntington, after her withdrawal from the Wesleyan communion.

**Huntingtonians.**— A sect founded by William Huntington, known as the "preaching coal-heaver," who laid great stress upon the doctrines of faith and indefectible grace. Practically extinct.

**Hutchinsonians, American.**— The followers of Mrs. Anne Hutchinson, who taught the Antinomian doctrines in the Massachusetts colony soon after its foundation. Extinct.

**Hutchinsonians, English.**— The followers of John Hutchinson, who, accepting the Bible as the source of all science and all philosophy, opposed the system of Newton and all other scientific theories that could not easily be reconciled with their belief. Extinct.

**Independent Methodists.**— A title assumed by several independent congregations of Calvinistic Methodists.

**Inghamites.**— A religious denomination founded in England in the 18th century by Benjamin Ingham, who taught a peculiar combination of Methodism and Moravianism. Extinct.

**Irvingites.**— Otherwise known as "The Catholic and Apostolic Church." A sect founded in 1831, its doctrines being based upon the teachings of Edward Irving, who held that by a new "outpouring" of God through the Holy Ghost the prophetic and apostolic offices had been re-established. Its ritual is very elaborate.

**Jacobites.**— A sect of Christians in Asia, the members of which have remained true to the Monophysite doctrines. Its churches include three patriarchates, those of Antioch, Armenia and Alexandria.

**Jains.**— A non-conformist Hindu sect, the members of which believe that every object in the world, including plants and minerals, as well as men and animals, possesses souls.

**Jansenists.**— A school of thought established in the Roman Catholic Church by Cornelius Jansen during the 17th century. It has frequently been the subject of the condemnation of the ecclesiastical authorities.

**Jerkers.**— A name, usually a term of opprobrium, applied to those sects whose members are in the habit of indulging in violent exhibitions of religious fervor on the occasion of revivals or other special meetings.

**Joachimites.**— A mystical sect which existed until some time in the 13th century. Its members believed that the earth was passing through the third and last period of its existence and that a new gospel would soon appear to supersede the Old and New Testaments.

**Julianists.**— A sect in the 6th century. It held that the body of Christ was incorruptible. Extinct.

**Jumpers.**— A name which was first applied to the Methodists of Wales because of their peculiar actions during times of religious frenzy.

**Kabbalists.**— Those who are devoted to the Kabbala, or the theosophical or mystical philosophy of the Hebrew faith.

**Kabirpanthis.**— The followers of Kabir, a Hindu reformer, who denounced idol worship and preached that the only religion was devotion to one god, irrespective of the name by which that god might be known.

**Karaites.**— Otherwise known as "The Karim," or "Scripturists." A Jewish sect which adheres stricly to the Scriptures, rejecting the authority of the Kabbala as well as the Talmuds.

**Kilhamites.**—The name often applies to the followers of Alexander Kilham, the founder of the "New Connection of Wesleyan Methodists."

**Labadists.**—A sect of Christian communists which existed until the middle of the 18th century. Its members upheld the doctrines of Jean de Labadie, who taught that as life was a perpetual sabbath, the observance of a particular day was unnecessary and that marriage as a holy ordinance was not valid unless both parties to it were believers, in which case the children of such unions were born without the taint of original sin.

**Lamaism.**— The Buddhism of Tibet, which teaches that the soul of Buddha is always present, reincarnate in the body of the Grand Lama.

**Latter Day Saints.** See **Mormons.**

**Leonists.** Same as **Waldenses.**

**Lesghians.**— A Mohammedan sect living in the Caucasus.

**Life and Advent Union.**— A sect which is similar to regular Adventism except that it holds that the souls of the wicked are exterminated and will not be present with the saints at the day of resurrection. See **Adventists.**

**Lollards.**— Otherwise known as "Bible men." The followers of Wyclif in England during the 14th century. Extinct.

**Low Churchmen.**— The designation applied to that branch of the Episcopal Church, the members of which strive to avoid anything savoring of sacerdotalism and whose chief regard for the ministry and the sacraments is based upon their relation to the religious life of mankind.

**Lucianists.**— The members of a Marcionite sect which existed during the 2d century. They held that while some representation of the soul and body would appear at the resurrection the actual soul and body would not participate in that event. Extinct.

**Lutherans.**— Although there have been many changes in the various branches of the Lutheran Church since the days of Luther the doctrines which he promulgated in the 16th century are the basis for the beliefs of all the sects which bear his name and which are now represented in almost every part of the Old and New Worlds. The title is also applied to all followers of that 16th century reform movement which cost the Roman Catholic Church so large a part of the Teutonic and Scandinavian constituency. See **Lutheran Church in America.**

**Macarians.**— A monothelitic sect founded by Macarius, patriarch of Antioch, in the 7th century. Extinct.

**Macedonians.**— A sect founded by Macedonius bishop of Constantinople, in the 4th century. Its members denied the Godhead or distinct existence of the Holy Spirit, claiming that the supposed third person in the Trinity was no more than a divine energy which God had diffused through the universe. Extinct.

**Malakanes.**— A millenarian sect in Russia, the members of which reject all sacraments.

**Mandæans.**— An Eastern sect that has never extended beyond Persia and Arabia. Its members are known as "Disciples of Saint John the Baptist," and, from the Christian point of view, their Christology is of a most heretical character.

**Marcellians.**— Followers of Marcellus, bishop of Ancyra, in the 4th century. They held that the Holy Spirit was merely an impersonal agency of God. Extinct.

**Marcellinists.**— A Gnostic sect of the 2d century. Extinct.

**Marcionites.**— An ascetic Gnostic sect of the 2d century. Its members rejected the Old Testament and denied both the incarnation and the resurrection. Extinct.

**Maronites.**— The ecclesiastical name for a Syrian tribe inhabiting the slopes of Lebanon. In the early days the Maronites followed the monothelite heresy, but, in 1445, they were reunited to the Roman communion, although they have continued to retain their own liturgical customs, just as they elect their own patriarch.

**Martinists.**— A school of religionists, or kind of pietist freemasonry, instituted by Chevalier Saint Martin. Among other peculiar doctrines the founder taught that man is antecedent to nature, having existed in spirit, of the same essence as God Himself, prior to his existence in body.

**Massilians.**— The members of a Semi-Pelagian school once numerous in France.

**Materialists.**— Those who hold that matter is the first and only principle and that mind is the derived result.

**Melchites.**— The name by which the orthodox Egyptians are distinguished from the Jacobites.

**Meletians.**— A 4th century sect, followers of Meletius, a schismatic Egyptian bishop. Extinct.

**Men, The.**— The name applied to a class of lay preachers who frequent the Scottish Highlands. They wear a distinctive dress and are in direct opposition to the Kirk in all their ministrations.

**Mennonites.**— A general designation for those sects which were known as Anabaptists until the time of their reformation by Menno, in the 16th century. See **Mennonites.**

**Methodists.**— A general designation for those sects which are more or less the outcome of the institution of John Wesley's confraternity, in 1739. The parent sect was known as Wesleyan Methodists, but many other important branches have been organized since that time, including the Methodist Episcopal Church, Methodist Reformed Church, Methodist Protestant Church, Union American Methodist Episcopal Church, Methodist Episcopal Church South, Congregational Methodist Church, New Congregational Church, Primitive Methodist Church, Free Methodist Church, Independent Methodist Church, Methodist Connection and various African and Zion Methodist branches, which are composed of colored persons. See **Methodist Churches of the World.**

**Michaelhahnites.**— A pietist and millenarian sect organized by Michael Hahn after his separation from the Evangelical Lutheran Church of Wurtemberg. Extinct.

Millenarians.— A general designation for those Christians who anticipate the early second-coming of Christ. There are many bodies of millenarians, all professing different doctrines, the more extreme asserting that the dead will finally be restored to life, including all its bodily pleasures, on earth.

Mohammedans.— The followers of the Prophet Mohammed, who began to propagate his faith in Arabia in 611. The name which was given to this religion by its founder was "Islam," one meaning of which is "to submit wholly to God and to acknowledge Him only as Lord." The entire Mohammedan faith may be briefly explained by reference to its two articles: (1) "There is no God but God," and (2) "Mohammed is His Prophet," a proposition the acceptance of which makes every doctrine of divine authority.

Molinists.— There have been two sects which have borne the name of Molinists: (1) Those who agreed with Luis Molina regarding the doctrines of free will and predestination, and (2) the followers of Miguel Molinos, the Spanish mystic who taught the doctrine of the direct relationship between the soul and God. The latter were also known as Quietists. Both are extinct.

Monarchians.— A designation applied to those who deny the distinction of persons in the Trinity.

Montanists.— A 2d century sect, the followers of which believed in the divine and prophetic inspiration of Montanus of Phrygia. Extinct.

Moravians.— Otherwise known as Moravian Brethren. A sect which occupies a theological position which is almost identically that of the Evangelical Lutheran Church. Formerly affiliated with the Taborites, it withdrew from the communion during the 15th century.

Morelstschiki.— A fanatical Russian sect whose practices are said to be in keeping with its name, which means "self-immolators."

Mormons.— Otherwise known as Latter Day Saints. A religious system organized by Joseph Smith, who claimed to have found his inspiration in a "Book of Mormon," which he had unearthed and translated. The doctrines have been further extended by later revelations, one of which, the "Celestial Law of Marriage," which was promulgated in 1852, and which authorized the practice of polygamy, having resulted in a reform movement which brought about the secession of a large body of Mormons who assumed the name of the "Reorganized Church of Jesus Christ of Latter Day Saints." See Mormons.

Muggletonians.— An English sect founded in 1651 by Lodowick Muggleton and John Reeve, who claimed to be the two witnesses referred to in Revelations. They insisted that they were divinely inspired and taught many doctrines peculiar to themselves. Extinct.

Mystics.— The general designation applied to those who believe that a rapt soul may enter into union with the divine by means of ecstatic contemplation.

Naumbergers.— An obscure evangelical sect which carries the simplicity of its dress to such extreme as to use hooks and eyes instead of buttons.

Nazarenes.— A 4th century sect of Jewish Christians. While observing the Mosaic ritual they accepted the divinity of Christ and looked for his early second-coming.

Necessitarians.— A general designation applied to those who believe that a fixed and unchangeable law governs everything.

Nestorians.— The followers of Nestorius, who denied the hypostatic union of the two natures in the one person, Christ. Two sects of Nestorians, the remnants of the once-powerful denomination, still exist, one in Turkey and Persia, and the other in India.

Netovtschins.— A sect of Russian dissenters who believe that antichrist has commenced the ruin of the Church and that all holiness is gradually being extinguished.

New Jerusalem Church. See Church of the New Jerusalem.

New Lights.— A designation sometimes applied to the Free Will Baptists and Separatists.

Niobites.— A monophysite sect which was finally absorbed into the orthodox communion. Its members held that the human nature of Christ was lost in its union with his divine nature.

Noetians.— The followers of Noetus, a 2d century heretic, who held that Christ was the actual embodiment of the Father and that it was the Father Himself who was born and had suffered death on the cross.

Nonconformists.— A designation sometimes applied to various sects of Protestant dissenters.

Novations.— An austere 3d century sect which was absorbed by the Mother Church before the 6th century, its differences having been chiefly in regard to matters of church discipline.

Oahspe.— A sect of American vegetarians, extremely primitive in character. Its tenets prohibit divorce and second marriage and its members are not permitted to have recourse to law.

Old Catholic.— A movement inaugurated in Germany as a protest against certain dogmas of the Roman Catholic Church.

Old Lutherans.— The name applied to those Lutherans of Prussia who have refused to enter into affiliation with the United Evangelical Church.

Old School Baptists.— The name assumed by a religious sect which still maintains the strict doctrines of Calvinism.

Old Two-Seed-in-the-Spirit Predestinarians.— A strictly Calvinistic sect of American Baptists.

Omish Church.— The name applied to a strict sect of primitive Mennonites.

Ophites.— A Gnostic sect which held that the serpent that tempted Eve was the impersonation of divine wisdom.

Osiandrians.— The followers of Osiander, a 16th century theologian who taught that the attainment of the essential righteousness of Christ was necessary to justification by faith.

Pantheists.— The members of a philosophical school which teaches that God is in everything and that everything is God.

Parsees, or Parsis.— The followers of Zoroaster, who founded the ancient religion of Media and Persia, about 1000 B.C.

Paulicians.— A sect founded in the 7th century, the members of which held that all matter is evil and that Christ had a purely ethereal body and suffered only in appearances. Extinct..

Peculiar People.— A sect which in almost every respect resembles the Dunkards.

Pelagians.— A sect which held that there was no original sin, but that each soul was created sinless and free. Extinct.

Peremayanoftschins.— A sect of Russian dissenters which requires the reordination of the clergy.

Perfectibilists.— A name applied to those who hold that absolute perfection is attainable during the present life.

Perfectionists.— The name assumed by an American sect established by John Humphrey Noyes, in 1845. In addition to teaching perfect holiness through complete reconciliation with God, its founder maintained the equality of the sexes and the community of goods.

Picards.— A sect suppressed in the 15th century because of alleged immoralities. They held that salvation was obtainable only through the restoration of man's primitive innocence.

Pietists.— A general designation applied to those who claim to be possessed of extreme piety.

Plymouth Brethren.— A sect which holds the two doctrines of Predestinarianism and Millenarianism and which does not maintain a separate ministry.

Pemorane.— A sect of Russian dissenters which has no separate ministry and which requires rebaptism of converts.

Popoftschins.— That branch of Russian dissenters which continues to maintain the office of priest, or "pope."

Positivism.— A modern school of skepticism, founded by Auguste Comte. As a religion, Positivism is nothing less than the worship of humanity; as a philosophy, it teaches that nothing should be accepted as true unless it can be positively demonstrated.

Predestinarians.— A general designation applied to those who believe that each soul is predestined for heaven or hell from all eternity.

Presbyterians.— The name assumed by a denomination which maintains that the ministry of the Church should consist of but one order, that of presbyters, or elders. Its creed, which has been Calvinistic since the establishment of the denomination, is now, in some places, in process of alteration.

Princeites.— A small English sect established in 1840 by Henry James Prince, who professed that his person represented a new dispensation of the Holy Ghost by which the dispensation of Christ was to be superseded. It is now practically extinct.

Protestant Episcopal Church.— The American representative of the Church of England, the denomination which led in the protesting reformation of the Roman Catholic Church in that country. In addition to its creeds it adopts the principles of the Thirty-nine Articles and makes use of the Book of Common Prayer. See Protestant Episcopal Church.

Puseyites.— The name sometimes applied to the High Church school in the Episcopal Church, from that of Dr. Pusey, who was one of the leaders in the "Tractarian" or ritualistic movement.

Pyrrhonists.— The designation applied to that school of extreme skepticism which denied the possibility of attaining with certainty any absolute truth.

Quakers.— Otherwise known as Friends, or as the Society of Friends. A sect founded by George Fox. Its members reject all sacraments, possess a mixed but not settled ministry which depends upon the inspiration of the Holy Spirit for its utterances, and refuse to participate in wars or to take oaths. They also maintain a peculiarity of dress and a simplicity of speech which is quite in keeping with their life of peace and meditation. See Friends, The Religious Society of.

Quietists.— A designation often applied to a school of mysticism, the followers of which profess to resign themselves passively to what they regard as divine manifestations. The name is also applied to certain distinctive sects like the Bourignonists and Molinists.

Rappists. See Harmonists.

Rationalists.— Those who maintain that reason is the one test of truth in matters of religious faith and who are guided by this theory in their interpretations of the Bible.

Reformed Dutch Church.— The Reformed Protestant Dutch Church which was instituted in the Netherlands during the 16th century. In 1561 it adopted a confession of faith, known as the Belgic Confession, which was prepared by Guido de Bres, who took for his model the Calvinistic confession of the Church of France. This body was the first Reformed Church instituted in the American colonies.

Reformed Dutch Church, True.— A sect resulting from the secession of a party led by Rev. Sol Froeligh, in 1822. They held that the Reformed Dutch Church had become erroneous in doctrine, lax in discipline and corrupt in practice. During recent years the sect has gradually dwindled away although it is still in existence.

Reformed Episcopal Church.— Founded in 1873 as a church of the reformation, or as a protest against what it termed the errors in the position and practice of the Protestant Episcopal Church.

Reformed German Church.— That portion of the Protestant Church which, being unable to embrace either the teaching of Luther or of Zwingli, endorsed instead the Melanchthonian compromise.

Reformed Presbyterian Church.— Otherwise known as Cameronians. A sect founded in the 17th century as a protest against what its members regarded as the "unworthy compromise" of the Established Church.

Relief Synod.— A body of Scotch dissenters whose secession was the result of their opposition to the existing system of patronage.

Remonstrants.— A title applied to the Arminians for the reason that they had called their creed, adopted in 1610, "The Remonstrance."

Restorationists.— A small sect the beliefs of which may be designated as Universalism in a modified form.

Ritualists.— Another designation for High Churchmen.

Roman Catholic Church.— That body of Christians who look to the Holy See for direction in spiritual things. See Catholic Church.

Russian Orthodox Church.— The national Church of Russia. It differs in belief but slightly from that of the Roman Catholic Church, from which it separated about 1,000 years ago.

Ruthenians.— The members of the Ruthenian Church are converts and the descendants of converts from the Russian Church who now maintain obedience to the Pope in spite of the fact that they have never altered their ancient rites and discipline and still use the Greek liturgy, which they have translated into Old Slavonic.

Sabbatarians.— Those who insist upon the strict observance of the Sabbath as a tenet binding upon all Christians.

Sabbatians.— A 4th century sect the members of which adopted the Quartodeciman rule. Extinct.

Salvation Army.— A quasi-military organization formed to promote the revival of religion among the masses. It was organized in England, about 1865, by William Booth, a Methodist evangelist. At that time it was known as the Christian Mission, and it retained the title until 1878, when it was changed to that of the Salvation Army. Its theological position is thoroughly evangelical.

Samokrischtchins.— A name which signifies "self-baptizers," and which as applied to a sect of Russian Christians indicates its theological peculiarity.

Sandemanians.— A denomination founded in the 17th century by Robert Sandeman, a disciple of John Glas. Its members maintain a community of goods; abstain from blood meats and from things strangled, and participate in ove feasts and a weekly communion.

Satanists.— The members of a strange sect which worships and prays to Satan not only because of his present power to do evil, but on account of his future power to do good.

Schwenckfeldians.— A sect of German anti-sacramentalists founded at the time of the Reformation by Casper Schwenckfeld.

Scottish Baptists.— A sect which differs from other Baptists only by being more congregational in government and having a somewhat stricter form in discipline.

Scottish Kirk.— The Established Presbyterian Church of Scotland, which, founded on the ruins of the ancient Scottish Church, in the 16th century was adopted as the National Establishment by act of Parliament.

Second Adventists. See Adventists; also Millenarians in this article.

Secularists.— The term Secularist is most generally applied to the members of that school of skepticism which holds that man should devote his attention only to the duties and interests of this world.

Seleucians.— Followers of Seleucus, who rejected baptism by water and who taught that there would be no resurrection of the body. Extinct.

Seventh-day Adventists.— The most primitive form of Adventism, its members practising many of the ancient Christian rites. See Adventists.

Seventh-Day Baptists.— A sect which differs from other Baptists chiefly in the observance of Saturday, or the seventh day of the week, as its day for rest and worship.

Shafiites.— A Mohammedan sect, one of the four branches into which the orthodox sect of Sunnites has been divided.

Shakers.— A sect of American millenarians founded in 1776 by Ann Lee. Although it does not impose celibacy as a necessary rule of life, married couples are not permitted to live together in its communities.

Shaktas.— A Hindu sect, the members of which worship the divine power under its female representation.

Shiaha.— A Mohammedan sect which claims to be the one orthodox branch of the religion because they accept Ali, the first cousin of Mohammed, as the successor to the prophet, rejecting the other caliphs who are accepted by the Sunnites.

Shiites.— One of the two great divisions of Mohammedanism. Its doctrines are directly contrary to those of the orthodox sect, the Sunnites.

Shintoism.— The state religion of Japan. It teaches the existence of both good and evil gods.

Sikhs.— A sect founded in India, about 1500, upon principles of monotheism and human brotherhood. See Sikhs.

Six-Principle Baptists.— The oldest sect of American Baptists. Its doctrines are founded upon the "six principles" mentioned in the first three verses of the sixth chapter of the Epistle to the Hebrews: (1) Repentance from dead works; (2) faith toward God; (3) baptism; (4) laying on of hands; (5) resurrection of the dead, and (6) eternal judgment.

Skoptzi.— A fanatical sect of Russians. Its members practise severe penances, including, it is said, self-mutilation.

Smartas.— One of the three great divisions of the Hindu religion.

Society of Friends. See Friends, The Religious Society of.

Socinians.— The followers of Socinius, who denied the divinity of Christ and the atonement, who rejected the sacraments and the authority of the Scriptures, and who held that the soul of man was born pure.

Southcottians.— The followers of Joanna Southcott, who professed to be the inspired woman of Revelation, who was predestined to give birth to the new Messiah. Although she died of dropsy 10 days after the date on which, as she had predicted, this event was to occur, her disciples maintained their faith in her supernatural gifts, and the sect still exists in small numbers in England.

Spiritualism.— A religious body composed of those who believe that it is possible for man to hold communication with the spirits of the departed.

Starovertzi.— A designation applied to those who refused to participate in the ecclesiastical reforms introduced in the Russian Church in the 17th century. The name signifies the "men of the ancient faith."

Sunnites.— The name applied to the orthodox Mohammedans who constitute the largest sect of the Moslem world. Its members accept the books of Sunna, said to be the verbal utterances of Mohammed, as well as the Koran, as the sources of doctrine. See Sunnites.

Swedenborgians.— Otherwise known as the Church of the New Jerusalem. A religious system promulgated by Emmanuel Swedenborg, who taught that the last judgment had taken place in the year 1757, when the "Old Church," or Christianity had given place to the new dispensation as represented by the "New Church" of Swedenborg. See Church of the New Jerusalem.

Syrian Church.— A religious body still under obedience to the Pope. Its members continue to maintain the ancient Syriac rites, which are common alike to the Jacobites and themselves.

Taborites.— The members of one of the most extreme parties of Hussites.

Taoism.— The materialistic religion of China.

Theists.— Believers in a personal Creator and Divinity, however conceived as related to man. The term is used as contrasted with Deists; Deism being the belief in a divine principle, not a personality.

Theosophists.— Those mystics who affirm that they are admitted to a knowledge of the mysteries of being, on the side of nature as well as upon that of religion, by means of an internal and supernatural illumination. One of the most modern applications of the word is as a designation for the followers of Mme. Blavatsky.

Traskites.— An early name for the Sabbatarian Puritans.

Tübingen School.— A name applied to a certain rationalistic school of philosophy, the members of which questioned the credibility, integrity and reliability of the New Testament.

Ultramontanists.— From a Roman Catholic point of view this name is applied to those who believe that the Pope is supreme spiritual ruler over every part of the Christian Church.

Unitarian.— A name applied to those who deny the distinction of persons in the Trinity and who hold that they in themselves only hold, in its true sense, the Unity of God.

United Brethren.— Otherwise known as United Brethren in Christ. A sect whose present doctrinal position is quite similar to that of the Moravians. Although never officially instituted it grew out of the attempt of William Otterbein to found a church that would unite the various Presbyterian sects as one body of Christians.

United Presbyterians.— A body composed of two sects of Scotch dissenters, the Associated and the Relief synods.

Universalists.— Those who believe in the ultimate salvation of all mankind.

Utilitarian.— A designation applied to those who hold that man's actions derive their character, in a moral sense, from their consequences.

Vamamargis.— The name applied to those persons who, in Hinduism, worship the female side of the dual nature of Vishnu.

Volunteers of America.— An offshoot from the Salvation Army resulting from a misunderstanding between the leaders of the two bodies. As in the Salvation Army both sexes participate in its meetings, and, like the older body, while it has no formulated creed, it is thoroughly evangelical.

Wahhabees.— Followers of Abd-el-Wahhab, a Mohammedan reformer of the 18th century. They strenuously oppose all practices not absolutely sanctioned by the Koran.

Waldensians.— A reforming body of Christians, the members of which participated in the Reformation. A Waldensian church now existent in Italy numbers more than 20,000 members.

Waterlanders.— A sect of Mennonites, similar in doctrine but less rigid in discipline than the main body.

Wilburites.— A branch of the Society of Friends who followed John Wilbur in his protests against the actions of the Society in abandoning its original principles.

Wilkinsonians.— A 19th century American sect the members of which accepted the statements of Jemima Wilkinson, who asserted that she was divinely inspired, having been raised from the dead.

Yezeedees.— An ancient sect of unknown origin. Its members form a tribe of individual nationality located in the neighborhood of Mosul. They not only believe in God but also in Satan, whom they recognize as the chief of the angelic hosts. Admitting that he is suffering punishment now, they believe that he will eventually be restored to his originally high station. As the result, like the Satanists, they believe that it is right for man to pray to him.

Zanzalians.— A designation applied to the Jacobites of the East.

Zoarites.— The name applied to a sect of American Lutherans.

Zoharites.— A modern Jewish sect which takes its name from the Kabbalistic book of Zohar, which is held in great veneration.

Zoroastrians. See Parsees.

John R. Meader.

**RELIGIOUS SOCIETIES.** See Orders, Religious.

**RELIGIOUS SYMBOLISM.** Wolfgang Menzel (1854) wrote «The picture is holy, same as the Word. The Savior himself spoke pictorially. The picture is as powerful as the word and more penetrating than words. The world was more pious while Christian symbolism was in vogue; laymen and priests were better trusted as long as everyone understood the pictures with which Art decorated the Church. . . . The world was more pious while it knew which symbol belonged to each season, yes, to each day of the year and that connected with the name of his Patron; while they yet recognized the symbolism of natural phenomena every season, and even that of the animals, plants and stones, as the signature of the Holy One in all Creation.» We can call religious symbolism (when inspired) revealed or interpretative religion, or, as Hugo of Saint Victor (who developed Christian symbolism so greatly) says: «A symbol is the comparison of the visible forms for the showing forth of the invisible.» Faced by the powers of the elements, fire, water, earth, lightning, etc., it soon became the natural instinct that primitive man should revere, fear and worship these active (live) elements as conscious entities and that nature should take on in the primæval brain a nomenclature easiest defined in symbol form. Hence the earliest religion and the earliest symbolism may be reasonably considered as one and the same thought-development of man. All through the evolution of the religious cults from time immemorial we will find the worship of the sun and light up to the present day in some form, open or occult. To the primitive man the warmth and productive power in nature of the sun's rays has been looked upon as a beneficent agent; and light, which dissipates the hidden dangers of night or darkness, has naturally ever been held in human regard as a friend and defender of humanity against evil. The primary consideration of light brings flame to recognition, and we learn that the ancient Persians (as well as modern Parsees) reverenced flame as son of Ormuzd; in Rome flame was kept pure by the pure daughters (vestals) of the leading families; in Israel the Jews kept watch over it to dispel darkness and the inherent evil spirits. Fire was the Assyrian as well as the Germanic test of purity of those accused of evil; fire appealed as purifying agent on the sacrificial altar since and probably during prehistoric times. For the candles on our altars are but a continuation of those displayed in the seven-branched candlestick in King Solomon's temple. The altar, the Latin *altare* (from *alte*, high) was any kind of an elevation on which to sacrifice, and the hill or mountain summit was preferred on which to erect it. Nearest to heaven, the mountain height has always been a reverenced symbol the world over, whether it be Mount Olympus of the Greeks or Fuji Yama of the Japanese, while the Christian devotee selects Mount Athos and other heights on which to live in prayer, and the sacred character of Mount Lebanon comes up prominently to mind.

The source of origin of religious symbolism can be definitely placed in the Orient, the birthplace of all occultism, for the primal elements of occultism are due to the study of the cosmic laws, the world's circumambient physical and spiritual powers and the part man could take in their control. The natural development and progress in such study brought the visible universe into its realm, and the planets found their place in the curriculum. Astrology gave the laws of astral motion, their cause and their power over the human race. Closer investigation evolved the science of mathematics and geometry — always as corollary and indivisible part of cosmic philosophy with symbolism as a large portion of its language. The science of medicine was an outgrowth from the master mind of Aristotle and such followers as Galen, Ibn Sina, Paracelsus, etc. Diagnosis included the functional powers of the sun, moon and planets, and idol worship of the untrained mind of the pagan was an act of gross materialism and misunderstanding of the occult purpose of symbolism as divine interpretation.

Harking back to the first stages of occultism and knowledge we get to Buddhist symbolism with its wheel, bowl, yellow robe, etc. Chinese history tells us how early the heavenly bodies received the attention of scholars and how the knowledge brought into practice hidden powers of man. Then westward came the initiated and taught their disciples the mystic religion. The Chaldeans transmitted the teachings to the Egyptians. Greeks and Romans adapted their religious tenets to the Oriental pantheology and philosophy. Early Occidental masters of symbolism were Thales of Miletus (6th century B.C.), the founder of the Ionic sect of philosophers; Anaxagoras, Archelaus, master of Socrates, etc. The Jews soon absorbed the study of astrology with its planetary significance and zodiacal mystic rulings, the symbolic value of numbers (*Kabala*), etc. As an Eastern people they were naturally early imbued with a symbolic system, and the Mosaic plan frequently discloses the fact in the Old Testament, but we must remember the Egyptians (under whom the Jews had dwelt for so many years) were, in their cult, symbolists. The cult of Judaism has been said to have been built on a monotheistic and ethical basis; not like others, on natural religion and on physical and cosmic hypotheses. A learned Jewish rabbi (Samson Hirsch) declares that the purpose of Biblical symbols is not to veil the mind or to lay down secrets that are puzzles to be elucidated, as is the case with other religions, but, on the contrary, to make plainer the inner meaning in the rendering of which the meaning is mostly declared in words added to the expression. Of such symbols might be mentioned the rainbow, symbol of the pact between God and man; innumerable stars, symbol of the promised riches of Israel; stone and ladder of Jacob's dream; prohibition of eating the hip sinew, in everlasting memory of the struggle with God; the commandment to take off the shoes; the blood of the Paschal lamb; shearing of the Levites' head; washing and bathing rites, anointment, laying on of hands, etc. For in their liturgical ritual, as with those of former and later cults, the sacrifice of burnt offering on the altar has always been symbolic of self-abnegation; the burning of incense, symbol of devout prayer reaching to heaven, and so on. With their rigorous sect of Essenes we can recognize, in their peculiar ritual of apparent worship of the rising sun, a physical expression of symbolic reverence, for they seem to have considered the Torah as entirely symbolic in all its text.

In the claim, by some few, that John the Baptist was an Essene, we come to the early Christians and the Gnostics. Pythagoras (6th century B.C.), with a knowledge gained (according to ancient claims) by years of actual residence and deep study among the Egyptians, Phœnicians, Chaldeans, Jews, Arabians, Gallic Druids, Persian Magi and Indian Brahmins, founded at Crotona a religious brotherhood for the reformation of society, besides the study of philosophy. The science of numbers (mathematics and astronomy) was the basis of theoretical teaching developing into numerical symbolism and the displaying of dots as units in symmetrical patterns (as on our dice and dominoes), each pattern group becoming a symbolic unit and thereby becoming the essence of cosmic substance and symbols of such. Later the philosophy of Aristotle (4th century B.C.) with its ethics gave much impulse to the cults, and out of the teachings of these great Greek master minds, with such links in the propaganda of mystics as Basilides, Marcion, Valentine, Heracleon, Ptolymeus, Apelles, etc., flourished gnosticism. Thus we get such sects as Ophites, Cainites, Sethians, etc. Thus we have in the first three centuries or more of the Christian era a symbolic cult supposed to cover the entire knowledge of religious sublime principles. In 325 A.D. the religious usage of symbolism was interdicted, but Byzantine churches followed a symbolic ritual containing much of the ancient Oriental mystic wisdom. The symbolism of the Moslem doctrines and architecture has been claimed as being taught to Mohammed by his Jewish secretary, who in turn gained initiation from the Aristotelian school. The cult of Sufism, with its deep occult symbolic learning, is found practised by its adherents in the land of the Moslem. The symbols of the pagan and those of the early Christian Church, as Harnack says, "were never mere signs, but always embodied a mystery." Hence water may be a symbol of cleansing power but the priestly blessing of the water incorporates the mystic value into the water; the bread and the wine are symbols of the Flesh and Blood, but the ritualistic sanctification produced the embodied Eucharist. Great teachers of the Christian symbolism were Hugo of Saint Victor (12th century), Durandus (13th century), etc. Much of the symbolic ritual of the Christian Church in Europe was brought from the Orient by the Crusaders, who imbibed their knowledge from Jew, Moslem and other sects that they encountered. And the persecution of the Knights Templar, early in the 14th century, for idolatry was based on rumors of their Oriental symbolic ritual held in mystic secrecy, no doubt, while the real incentive was jealousy of their power and the desire to grasp their $30,000,000 annual income derived from some 9,000 rich estates. Included in the ritual and architecture of the Roman as well as the Greek Catholic Church are most of the Oriental occult branches of symbolism, often deviating in form or interpretation. Thus we find a very thorough system of the symbolism of numbers, of colors, of flowers, of animal representation of the Evangelists (Luke as lion, John as eagle, etc.). The priestly vestments are given symbolic form, even the instruments of ritual, as the crozier (taken from the pagan *baculus,* badge of the cynic philosophers) of episcopal office. But restricted space forbids discussion of symbols and their interpretation in this article dedicated to the history of religious symbolism. More information on several symbols will be found under titles Symbolism, Dove, Dolphin, Dragon, Eagle, Colors, Lamb, Lion, Dog, Heart, Devil, Rose, Vine, etc.

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Clement W. Coumbe.

**RELIQUARY CROSSES.** See Crosses and Crucifixes.

**RELIQUES OF ANCIENT ENGLISH POETRY,** an anthology of old English ballads and other verse first published in 1765 by Rev. Thomas Percy (q.v.), vicar of Easton Maudit, Northamptonshire, who later became bishop of Dromore, Ireland. During a visit at the house of his friend Humphrey Pitt at Shifnall, Shropshire, he rescued from the hands of a housemaid, who was about to use it to light a fire, an early 17th century folio manuscript, which had been “lying dirty on the floor under a bureau in the parlour.” At the suggestion of William Shenstone he made it the basis of the collection of English ballads, revised and edited in the best taste, which became famous as ‘Reliques of Ancient English Poetry.’ This anthology has been called “the bible of the Romantic movement.” Breathing the primal emotions of folk-poetry it created an entire change in the poetic spirit of the age and in a rebound from classical to human elements gave a more natural and virile tone to English verse which found its best exemplification later, in the ballad literature of Scott, Campbell and Coleridge, its influence also extending to German literature. Named in honor of Bishop Percy, the Percy Society (1840–52) was founded for the purpose of publishing old English poetry, by a group of scholars including Alexander Dyce, Halliwell Phillips, John Payne Collier and Thomas Wright. Edited in complete form by Hales, J. W., and Furnivall, F. J., the original ‘Folio Manuscript’ appeared in 1867–68. Besides the early editions of the ‘Reliques,’ including the 4th edition by the bishop’s nephew, Thomas Percy (1768–1808), several editions have appeared. Of late date are those of Wheatley, H. B. (London 1891; New York 1910); and the edition of ‘Everyman’s Library’ (New York 1906).

**REMAINDER** is defined in law as an estate which commences after the determination of another estate in the same property, which has previously been limited by the same conveyance. A remainder becomes vested whenever the preceding estate is limited so as to determine on an event which must certainly happen. It is the present right of one to the future enjoyment of an estate, which right takes effect on the determination of the preceding estate. Contingent estates usually give rise to considerable doubt. The intention expressed in the instrument by which the contingent estate is created governs. Contingent remainders are defined by statute in some States. A simple exposition of the legal character of the term is: If a man in unrestricted possession of lands grants them to A for a specified period, and, after the end of that period, grants them to B and his heirs forever, A is the tenant for the period, with remainder or reversion to B.

**REMBANG,** rĕm-băng′, Java, a seaport and the capital of a residency of the same name, on the north coast, west of the river Rembang, and 60 miles west-northwest of Samarang. Its well-protected harbor is one of the best in the island. It has a good trade in ship-timber, earthenware, paper, gold and silver work and in shipbuilding and near it are valuable salt-pans. The town contains a Protestant church, government school and an institute for girls. Pop. about 15,000.

**REMBRANDT,** rĕm′brănt or -brănt (full name written Rembrandt Harmensz van Rijn or Ryn), Dutch painter and etcher: b. Leyden, 15 July 1607; d. Amsterdam, 8 Oct. 1669. He was the son of a miller settled in Leyden; and an early shown disposition toward the life of an artist caused him to be taken from the Latin School at an early age and put into the studio of a Leyden artist who took pupils. In 1622 he was sent to a studio in Amsterdam. In 1623 he seems to have been working as an artist and there is a signed and dated picture of ‘Saint Paul in Prison’ in the Stuttgart Gallery, which is his earliest piece with an ascertained date. By 1630 he was settled in Amsterdam and in 1634 married Saskia van Ulenburgh, who lived with him only eight years, leaving one son, Titus. Saskia had property; and her death caused confusion in Rembrandt’s affairs because of her will leaving all of this property to Titus, with only a life interest to her husband, while in the meantime Rembrandt’s affairs had been in a bad condition. In 1656 he was finally sold out as a bankrupt. It is not perfectly known why the very prosperous painter who, in his early manhood, had a great deal of work to do as a portrait painter (always a profitable branch of the art), and whose etchings sold remarkably well, should have become so straightened in his circumstances. It is known that he bought very freely, surrounding himself with works of art of all kinds, of which he was a constant and diligent student and by means of which he gave himself that knowledge of the world which he did not obtain from travel, as it appears that he never crossed the frontiers of the United Provinces. It is also asserted that a certain change in popular taste left him at one side while it followed men whom we now deem greatly his inferiors in artistic power. He had many pupils and many assistants and even the interruptions caused by death and by loss of fortune do not seem to have checked the great production of his work, for between the time of his bankruptcy and the time of his death, 13 years later, he was as busily engaged and his work was fully as important as at any former time. The mention of a few works of art with their dates in the course of this article illustrates this fact sufficiently well.

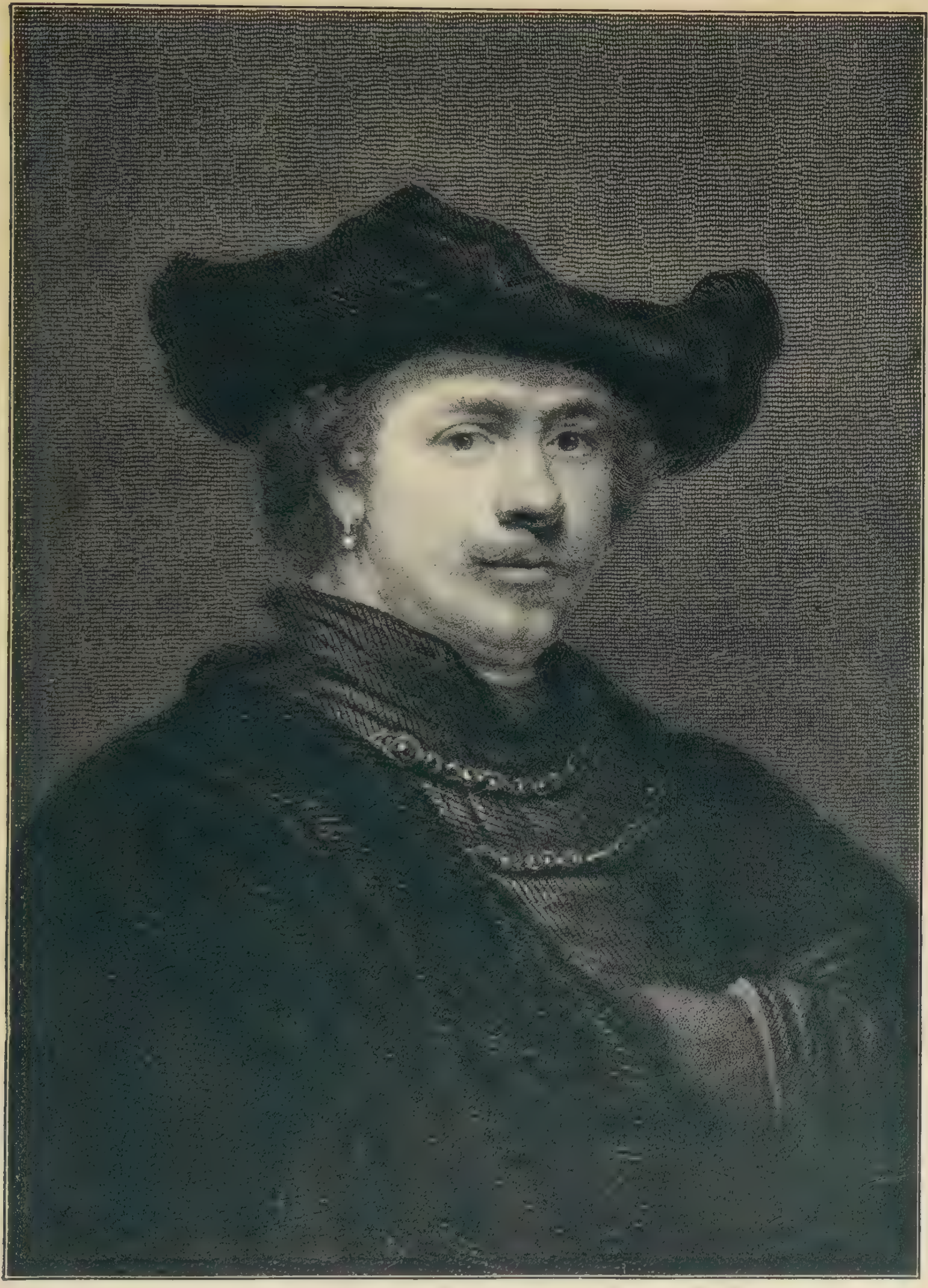
At a very early date Rembrandt's style as a painter was fixed. It is extremely original, founded on the work of no other artist of any school, based upon a strong perception of the beauty and value of pure light and shade in nature and in art. In one sense he was a great colorist, namely in that he conceived a painting as strictly the result of a disposition and combination of the hues and tints, treating all his work with as complete a color-scheme as that used by the great Venetians. There is this peculiarity, however, that Rembrandt's coloring is sombre and reaches its highest achievement in combinations of browns and grays with but few passages of primary color or of those hues which approximate to primary color. A blue sash may appear in a portrait and its effect of pure, bright color may be led up to and assisted by the glimmer of steel and the warm yellowish-brown of a buff coat; but as a general thing these effects are not his happiest achievements as we see the pictures now, and those are the most delightful to us in which he departs the least from his accustomed gravity of tone. There is a certain disappearing of the subject in blackness which is very disagreeable to many lovers of painting; and it is hard to form a conception of how far this had been the result of time producing changes in the pigments. Meanwhile the effect of a brilliantly modeled head coming to light from a profoundly gloomy background and helped by the painting of costume similarly relieved by light colors upon darkness, is very pleasing to many students; and apart from his obviously surpassing ability, Rembrandt is a delightful painter to many ardent lovers of the art of painting. To painters by profession Rembrandt must always be one of the men whose work commands the highest respect.

His power of characterization is not confined to painting and his small etchings drawn upon copper in a few straggling lines have as much of it, according to their subject, as the largest pictures. This power of characterization lifts him almost out of the category of the painters of his period. When he has character to express, either of an individual or of a race of men, he does it with a touch and an evidence of thought entirely his own. It may sometimes take a disagreeable, even an ignominious appearance and his drawing in a given case may not be dignified or refined or even truthful; while yet the significance of the statement he wishes to make remains uniformly distinct and positive.

Among his most important paintings are the 'Saint Paul in Prison,' in the Stuttgart Gallery, signed and dated 1627; the portrait of a man at Windsor Castle, signed and dated 1631; the portrait of his brother in the Berlin Museum, that of himself in Buckingham Palace and that of an old woman in the Hermitage collection near Petrograd; 'The Supper at Emmaus,' in the Louvre; and 'The Lesson in Anatomy,' at The Hague. There are two magnificent portrait groups, one of his middle life and one of his more advanced age; 'The Night Watch,' in the Amsterdam Museum, signed and dated 1642 and 'The Syndics of the Clothmakers' Company,' in the Amsterdam Museum, signed and dated 1661.

Of his etchings the number is so very great and the enthusiasm which they have excited among great classes of collectors and students during the 19th century is so intense, that it is very hard to name even a few characteristic specimens. The prices which they fetch at auction or at private sale are enormous (several thousands of dollars in many cases), though price is not always proportionate to merit, as rarity has much to do with this detail. Thus the famous 'Three Trees' (1643), of which a fine copy is worth as much money as a large oil painting by a modern artist and the wonderful portrait of the 'Burgomaster Six' are not necessarily as much better than other and less costly prints as their price would indicate. Their faultless work, however, is the main consideration and the portrait of Six must always be of extreme value when in fine condition, because the closely worked etching has caused the plate to suffer from use — there can never have been more than 40 or 50 impressions of great brilliancy. During his life and during the 18th century the so-called Hundred Guilder print, 'Christ Healing the Sick,' was the most famous; and since that time the etching, slight and but little worked over, 'The Death of the Virgin' (1639), is one of the most admired by artists of all Rembrandt's work in black and white; the wonderful portrait of the 'Goldweigher' (1639), that of the preacher Uijtenbogaert (1635), the famous Dr. Faustus, dated 1648, and several of the landscapes, especially the 'Cottage with the Great Tree,' and the magnificent 'Omval' dated 1645, are all etchings which are unsurpassable even among Rembrandt's own works.

The most complete book on Rembrandt, that of C. Vosmaer, 'Rembrandt, sa vie et ses œuvres' (1877), has furnished most writers since that time with their facts. A more recent work of great extent and thoroughness is that by Emile Michel, translated into English as 'Rembrandt, his Life, his Work, his Time' (London 1894). This book is elaborately illustrated. Small biographies by Knackfuss (1899), Malcolm Bell (London 1899), Neumann (1900), some of them well imagined, are contained in the different series of Artists' Lives. The etchings form a continual study and besides the famous work of Bartsch (1797), which is continually referred to, there have been works by Charles Blanc (1880) and Dutuit. The best recent works on the etchings are that by Rovinski (3 vols., Saint Petersburg 1890) and that by Hameston (London 1904). His complete etched work has been reproduced in admirable photogravure by Armand-Durand. The English etcher and student of etchings, Sir Francis Seymour Haden, has published a small book on Rembrandt's etchings, 'The Etched Work of Rembrandt' (1879–80), in which there is a careful investigation of the authenticity of some which may be thought to be by students or imitators. Consult also Bode, Wilhelm, 'Œuvre de



From the original painting by himself

HARMENSZ VAN RIJN REMBRANDT

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**REMEDIOS**, rā-mā′ťhē-ōs, or **SAN JUAN DE LOS REMEDIOS**, sän hoo-än′ dė lōs rā-mā′ťhē-ōs, Cuba, town, Santa Clara province, 32 miles east of the town of Santa Clara. It is four miles from the north coast, but is connected with its port, Caibarien, by rail, and also with the important towns of the island to the west. It is in a fertile region and carries on a good trade. Pop. 21,573.

**REMENSNYDER**, rĕm′ĕn-snī″dėr, **Junius Benjamin,** American Lutheran clergyman: b. Staunton, Va., 24 Feb. 1843. He was graduated from Pennsylvania College, Gettysburg, in 1861 and from its theological department in 1865. He served in the Union army in 1862–63, was ordained in 1865 and held important pastorates at Philadelphia, Savannah and New York, and originated the movement which resulted in the adoption of a common service ritual in all American Lutheran churches, and became president of the General Synod of Evangelical Lutheran churches in the United States in 1911. He published ‘Heavenward’ (1874); ‘Doom Eternal’ (1880); ‘Work and Personality of Luther’ (1884); ‘Six Days of Creation’ (1886); ‘Lutheran Manual’ (1892); ‘The Atonement and Modern Thought’ (1905); ‘Mysticism’ (1908); ‘The Post-Apostolic Age and Current Religious Problems’ (1910); ‘Eucken and the Problem of Life’ (1913); ‘What the World Owes Luther’ (1917).

**REMENYI**, rĕ′mān-yē, **Edouard,** Hungarian violinist: b. Heves, 1830; d. San Francisco, Cal., 15 May 1898. He studied violin at Vienna under Joseph Böhm. For his part in the insurrection against Austria in 1848 he was obliged to flee from Hungary. He came to the United States in 1849, but returned to Europe a few years later and in 1854 was appointed solo violinist to Queen Victoria. He returned to Hungary in 1860 under the amnesty, attained great fame and was appointed solo violinist to the emperor of Austria. In 1865 he began a professional tour of Europe; in 1878 returned to the United States, where he spent much time until his death. He made a second concert tour around the world, begun in 1886, and a tour in Canada in 1891–92. He possessed a high technical mastery of his instrument.

**REMIGIUS**, rĕ-mĭj′ŭs, **Saint,** the great apostle of the French nation: b. Laon, Picardy, 438; d. Rheims, 13 Jan. 533. He was appointed bishop of Rheims when only 21 years old. He it was who baptized Clovis, the founder of the French monarchy, who had been converted to Christianity chiefly through the influence of his queen, Clothilde. The ceremony took place amid imposing surroundings on Christmas Day, 496. Through the example of the king and the untiring exertions of Remigius almost the whole of Gaul was Christianized in the lifetime of the latter. Consult Migne, ‘Patrologia Latina,’ Vol. LXV (which contains some of the bishop’s letters); Aubert, ‘Vie de Saint Remi’ (1849). Other letters are preserved in the ‘Bibliotheca Patrum,’ and two documents, entitled ‘Testamenta,’ the genuineness of which has never been fully established.

**REMINGTON, Frederic,** American artist and author: b. Canton, N. Y., 4 Oct. 1861; d. Ridgefield, Conn., 26 Dec. 1909. He studied at Yale Art School and the Art Students’ League, New York, and later went west where, as cowboy and stockman on a ranch, he gathered the material that made him a success in scenes of frontier life. He contributed to the leading magazines and periodicals scenes of Western military and Indian life, and also events of the Cuban War of 1897–98. Few illustrators have drawn the horse with so much character and life-likeness. He produced several sculptures, such as ‘The Broncho Buster’ and ‘The Wounded Bunkie.’ As author and illustrator he produced ‘Pony Tracks’ (1895); ‘Crooked Trails’ (1898); ‘Frontier Sketches’; ‘John Ermine of the Yellowstone’ (1902); ‘The Way of an Indian’ (1906). As artist and illustrator he produced ‘An Impression from the Pony War Dance’; ‘The Last Lull in the Fight’; ‘The Advancer, or the Military Sacrifice’; ‘The Arrival of the Courier’; ‘A Buck Jumper,’ etc.

**REMINGTON, Joseph Price,** American pharmacologist: b. Philadelphia, Pa., 26 March 1847; d. 1 Jan. 1918. He was graduated from the Philadelphia College of Pharmacy in 1866, was professor there from 1874, dean from 1893, and in 1877–1915 was director of the laboratory. He became a member of the revision committee of the United States Pharmacopœia in 1880, and since 1901 has been chairman of the committee. He edited the ‘United States Dispensatory’ (1883–1909); ‘Lippincott’s Medical Dictionary’ (1897); ‘United States Pharmacopœia’ (1890, 1906, 1913). He wrote ‘Practice of Pharmacy’ (1886).

**REMINGTON, Philo,** American inventor: b. Litchfield, N. Y., 31 Oct. 1816; d. Silver Springs, Fla., 5 April 1889. He entered the small-arms factory of his father at Ilion, N. Y., and for 25 years was superintendent of the mechanical department. The perfecting of the Remington breech-loading rifles and of the Remington typewriter was mainly due to him. In 1886 he withdrew into private life and in that year Wyckoff, Seamans and Benedict bought out the Remington interest in the typewriter, and an assignment having been made, took charge of the Ilion plant. In 1888 the main plant passed to Hartley and Graham, who operated it as the Remington Arms Company.

**REMINGTON RIFLE.** See SMALL ARMS.

**REMITTENT FEVER.** See JUNGLE-FEVER; MALARIA.

**REMONSTRANTS,** those members of the Reformed Church in Holland who, in the year 1609, after the death of Jacobus Arminius, continued to adhere to his doctrines, and in 1610 presented to the states of Holland a remonstrance in which they defend the grounds of their dissent from the official creeds of the Reformed Church; thereafter they were styled

Remonstrants, and they are still represented in Holland by a small but scholarly and liberal sect. See ARMINIANISM; RELIGIOUS SECTS.

**REMORA,** or **SUCKING-FISH,** a popular name for any species of the family *Echineidida* and order *Discocephali.* It is about eight inches long and common in the Mediterranean. The top of the head is provided with a peculiar sucking disc, a modification of the spinous dorsal fin, composed of a series of plates arranged transversely, by means of which they attach themselves to moving objects and thus supplement their powers of locomotion. On the coast of Zanzibar and elsewhere they are used in catching other fishes and turtles, the remora being secured by a line fixed to the tail, and being sent in pursuit of the turtles, etc., to which it attaches itself by means of its sucker. The ancients believed in the remora's power of arresting and detaining ships in full sail through their suctorial powers; and Antony's galley at the battle of Actium was said to have been fixed by a remora, which defied the efforts of several hundreds of men to free the vessel.

The remoras are a group of oceanic fishes occupying a rather isolated position among the spiny-rayed *Teleostomi.* Five genera and eight species have been recorded from North American waters. Some of them appear to confine their attentions to particular species of large fishes, as the spear-fish, dolphins, etc.; others are less particular. The common species on the Atlantic Coast of the United States are the shark-sucker (*Echeneis naucrates*), very frequently found adhering to large sharks as well as to other fishes; *Remora brachyptera,* the sword-fish remora; and *Remora remora,* a species widely distributed in warm seas. They are not utilized for food nor for any other purpose in this country.

**REMSCHEID,** rĕm'shīt, Prussia, a noted manufacturing town, Rhine province, 1,110 feet above sea-level, 18 miles east-southeast of Düsseldorf. It is a town of much antiquity; originally a villa, it had a church as early as 1189, and by 1580 it contained several iron foundries, where pig-iron was worked into bars by hand. It has since maintained its importance as an industrial centre, producing various kinds of iron ware and especially high-grade cutlery and tools. Pop. 72,159.

**REMSEN, Ira,** American chemist and educator: b. New York, 10 Feb. 1846. He studied at the College of the City of New York, was graduated in 1867 from the medical department of Columbia, pursued chemical courses at Munich and Göttingen, and in 1870–72 was assistant to Prof. Rudolph Fittig in the chemical laboratory of the University of Tübingen. In 1872–76 he was professor of chemistry and physics in Williams College, and in 1876, upon the organization of the Johns Hopkins University, was made professor of chemistry in the new institution. He formed its chemical department and continued to direct the numerous researches of the Johns Hopkins laboratory, the facilities of which are not excelled in the United States. Despite the large amount of executive work devolving upon him in connection with his chair, he found opportunity for considerable original investigation, including that in connection with the oxidation of aromatic substitution products, the sulphides, double halides and the decomposition of diazo compounds by alcohol. In 1881 he made a study for the city council of a peculiar condition of Boston water, which he found due to a growth of fresh-water sponge in one of the artificial lakes from which the supply was derived. He also conducted for the National Board of Health special researches in various subjects, among them 'Organic Matter in the Air' and 'The Contamination of Air in Rooms Heated by Hot-Air Furnaces or by Cast-Iron Stoves.' He was made vice-president of the university and frequently, in the absence of the president, Dr. Daniel Coit Gilman (q.v.), acted as president. In June 1901 he was chosen president upon the resignation of Dr. Gilman and served as such till 1912, becoming president and professor emeritus in 1913. In 1873 he was elected to the American Association, in 1875 made Fellow, and in 1879 president of the chemical section, and in 1902 president of the association. He became a member of the National Academy of Sciences in 1882, and was at one time president of the American Chemical Society. He founded in 1879 and has since edited the *American Chemical Journal.* Among his textbooks are 'The Principles of Theoretical Chemistry' (1877); 'Introduction to the Study of the Compounds of Carbon, or Organic Chemistry' (1885); 'Introduction to the Study of Chemistry' (1887); 'The Elements of Chemistry' (1888); 'A Laboratory Manual' (1889); and 'Chemical Experiments' (1895).

**REMUS,** rē'mŭs, in the fabulous history of Rome, the twin brother of the founder of the city, Romulus, who in a quarrel slew him. According to the legend Romulus and Remus were the twin sons of Mars and Rhea Silvia, who was a daughter of Numitor, king of Alba. Amulius dethroned Numitor and pronounced death on the twins, but the latter were providentially saved, and when they grew up and were informed of the secret of their birth they killed Amulius, restored Numitor and founded the city of Rome. Remus was punished with death for jumping, in derision, over the wall of the new city.

**REMUS, Uncle,** a well-known negro character invented by Joel Chandler Harris (q.v.) and introduced to his readers in 'Uncle Remus: His Songs and Sayings' (1880). Uncle Remus, an aged plantation African, is used as the mouthpiece of quaint folk-lore tales current among the blacks of the South and detailing in picturesque and amusing fashion the adventures of Bre'r Rabbit, Bre'r Fox and other animals. The stories, interlarded with considerable homely philosophy, were gathered with much care by the author and awakened among students an interest in that domain of the beast-fable.

**RÉMUSAT,** rā-mü-zä, **Charles François Marie,** COMTE DE, French politician and man of letters, son of the Comtesse de Rémusat (q.v.): b. Paris, 14 March 1797; d. there, 6 June 1875. He was educated at the Lycée Napoleon and entered life as a journalist and lawyer. He was a member of the Chamber of Deputies 1830–48, and in 1848–49 of the constituent and legislative assemblies, in which he voted with the friends of order. From March to October 1840 he was Minister of the Interior, and in 1871–73 Minister of Foreign Affairs. He began public life as a Liberal, but ended it as a Conservative. During the Second Empire he lived in retirement, devoting himself chiefly to literary pursuits. His works include ‹De la Procédure par Juges en Matière Criminelle› (1820); ‹Essais de Philosophie› (1842); ‹Abelard› (1845); ‹De la Philosophie Allemande› (1845); ‹L'Angleterre au XVIII Siècle› (1856); ‹Critiques et Etudes Littéraires: Ou, Passé et Présent› (1857); ‹Bacon› (1857); ‹Politique Libérale: ou, Fragments pour servir à la Défense de la Révolution Française› (1860); ‹De la Théologie Naturelle en France et Angleterre› (1864); ‹Lord Herbert of Cherbury› (1874); ‹Histoire de la Philosophie en Angleterre depuis Bacon jusqu'à Locke› (1875), and numerous contributions to the *Revue des Deux Mondes.*

**RÉMUSAT, Claire Elizabeth Jeanne Gravier de Vergennes,** COMTESSE DE: b. Paris, 5 Jan. 1780; d. 16 Dec. 1821. She was married to Comte Auguste Laurent de Rémusat, Napoleon's chamberlain, and became an intimate friend and lady-in-waiting of Josephine; thus her position made her thoroughly acquainted with the life of Napoleon's court. Her ‹Essai sur l'Education des Femmes,› published 1824, received an academic *couronne,* and her ‹Mémoirs,› published in 1879–80, are particularly valuable for the light they throw on the court of the First Empire.

**RÉMUSAT, Jean Pierre Abel,** French Orientalist: b. Paris, 5 Sept. 1788; d. there, 5 June 1832. He devoted himself to the study of Oriental languages, particularly Chinese, while pursuing a course in medicine, and in 1811 published ‹Essai sur la Langue et la Littérature chinoises.› He received his degree as a physician in 1814 and entered one of the military hospitals, but in that year accepted the chair of Chinese which had been established for him by the Abbé Montesquieu at the Collège de France. He was admitted to the Academy of Inscriptions in 1816; in 1818, after Visconti's death, became editor of the *Journal des Savants,* and in 1822 he founded the Société Asiatique in Paris. His works include ‹Livre des Récompenses et des Peines› (1816); ‹L'invariable Milieu of Tsz'-tse› (1817); ‹Recherches sur les Langues Tartares› (1820); ‹Eléments de la Grammaire chinoise› (1822); ‹Mémoire sur la Vie et les Opinions de Lao-tse› (1823); ‹Recherches sur l'Origine et la Formation de l'Ecriture Chinoise› (1827), etc. Consult Silvestre de Sacy, ‹Notice sur la Vie et les Ouvrages de Rémusat› (1834).

**REMY,** rā'mĭ, **Alfred,** American philologist: b. Elberfeld, Germany, 16 March 1870. He came to the United States when 12 years of age and was graduated at the College of the City of New York in 1890. He studied the theory of music and piano under B. O. Klein in 1890–96; was musical critic for *Vogue* in 1895–97, and musical editor of *The Looker-On* during the same period. He was lecturer on the history of music at the New York College of Music in 1896–98; professor of modern languages at the Commercial High School, Brooklyn, in 1898–1911, and since 1911 has been instructor in that branch at the Commercial High School, New York. Author of ‹Alarcón's Novelas Cortas Escogidas› (1905); ‹Spanish Prose Composition› (1908); joint author ‹Biographical Dictionary of Musicians' (1916), etc.

**REMY, Arthur Frank Joseph,** American educator: b. Elberfeld, Germany, 26 June 1871. He was educated at Hamburg and Coesfeld, Germany, the College of the City of New York and Columbia University. In 1882 he removed to the United States and from 1891 to 1894 was tutor in Latin and Greek at the College of the City of New York. In 1898 he was Fellow in comparative philology, in 1899–1907 instructor in Germanic philology, and after 1907 professor of Germanic philology at Columbia University. He has lectured in German and English before various organizations and societies; before the Champlain Assembly at the Catholic Summer School of America and at the Columbia Institute of Arts and Sciences. Professor Remy has published ‹The Influence of India and Persia on the Poetry of Germany› (1901) and contributions in *Journal of the American Oriental Society,* the *Journal of English and Germanic Philology,* the ‹Catholic Encyclopedia,› etc.

**RENAISSANCE,** or **RENASCENCE,** is a term given to the period of transition from the Middle Ages to modern times, and to the movement of thought which characterized that period. Etymologically the French *Renaissance* — Italian *Rinascimento* — means *rebirth.* A rebirth of classical forms in literature and art is supposed to have dominated this transition. The metaphor must not be insisted on. There was no rebirth of antiquity in the Renaissance. The change from the mediæval to the modern mind was gradual. One phase of this change was a more general harking back to classical models. This phase, in its bearing on literature, is loosely designated the Revival of Learning. The classical scholars, who revived the refinement of Greek and Roman literature, *litteræ humaniores,* are called humanists.

**I. Italy.**— The Renaissance began in Italy. Here the memory of classical antiquity had never fully died out. North of the Alps the sway of scholastic philosophy was mightier than in the peninsula. Saint Thomas of Aquin (1225–74) taught at Paris; Albert the Great (1206–80) was a German; Alexander of Hales (d. 1245) and Occam (1280–1349) were Britons; Duns Scotus (d. 1308) was a Scotchman or a Briton, who taught at Oxford. In Italy the mediæval mind of the Florentine Dante (1265–1321), though thoroughly scholastic and Catholic, was at the same time steeped in the culture of ancient Rome. From Dante to Petrarch is a natural transition that cannot be called a rebirth of ancient ideas and ideals.

1. *Petrarch* (A.D. 1303–74).— The revival of learning in Italy is generally assigned to Petrarch. He is sometimes depicted as an out and out humanist who ignored a future life and made ever onward to a godless expression and gratification of self. Such a picture is false in coloring. Petrarch was ever devoted to the Church and its doctrines, even in the days of wildest enthusiasm for the humanistic culture of Rome and Greece. Witness his letter to Giovanni Colonna: «The true wisdom of God is Christ. Him must we love and reverence above all things, so as to learn true philosophy. We should first be Christians; then we may be what we will.» (*Epistolæ,* ed,

Fracasetti, Florence, 1864, ii, 112 ff.) When he was publicly crowned as poet and historian (1341), at Rome, in the Capitol, Petrarch showed his loyalty to the authority of the Church by laying the highly prized laurel crown as a votive offering upon the main altar of the basilica of Saint Peter. The imaginary conversations, held by Saint Augustine and the author, ‹De Contemptu Mundi,› ring true in tone, and doom pragmatistic sensuality to the condemnatory judgment of personified truth. Monastic life is praised in ‹De Vita Solitaria› and ‹De Ocio Religiosorum.› The ‹Trionfi,› in *terza rima,* celebrate allegorically the triumph of chastity over love, and of divinity over all. Bad traits there were in the character of Petrarch. He took minor orders, so as to enjoy ecclesiastical preferment, and never became a priest. Sensuality besmirched his life. He vauntingly craved for fame and flauntingly scorned scholastic theology. Apart from his ‹Canzoniere› and ‹Trionfi› Petrarch's greatest achievement in the cause of letters was the discovery of many a precious manuscript of the Latin classics. Lost works of Cicero and missing parts of the ‹Institutiones› of Quintilian, by means of his travels and researches, were again made accessible to the learned.

2. *Boccaccio* (1313–75).— There were in all Italy only very few men who knew anything at all of Greek when Petrarch and his friend Boccaccio put themselves under the tutelage of Leo Pilatus and undertook to gain an entrance into the literature of the Hellenes. Boccaccio was a thoroughgoing humanist. His ‹Filocolo› (1338) is wanton. ‹Ameto› (1340), a novel, tells with utter abandon the story of his mother's free love, and is fetid with the «reek of the rotten fens.» The 50 cantos in *terzine,* that make up the ‹Amorosa Visione› (1342) in praise of love, are befouled with filth. The ‹Teseide› (1341) gives the tale of Palemon and Arcite in *ottava rima;* it was annotated by Tasso and used by Chaucer for his ‹Knight's Tale.› The ‹Decameron› (1353) is a collection of an hundred tales, often begrimed with indecency, which Boccaccio gathered from various literatures and set forth in his own manifold and multiform style. The ‹Corbaccio› (1354) is a rank lampoon and cynical satire against woman. Boccaccio runs the gamut of the emotions, but plays chiefly and with free fling on lust. His humanism is a riotous revel of the passions. Monks and nuns to him are hypocrites whose ethics is that of the pig-sty. And yet Boccaccio remained loyal to the Church; he died in the faith, bequeathed his library to a friar and set the condition that the legatee pray for his soul. The humanism of Boccaccio was not directly anti-Catholic. He was three times Ambassador of Florence to Rome, received many favors from the Popes and was financially aided by Clement VI. While Boccaccio wallowed in the mire of the erotic myths and legends of paganism, the study of antiquity in a Christian spirit was ever encouraged by the papacy. Superstition and immorality were opposed by the Church, but the intellectual culture of the Greeks and Romans was accepted by her as a means of fulfilling her divine purpose. Saint Paul tried to gain the Stoics of Athens through the medium of their poets Aratus and Cleanthes (Acts xvii, 28). Some of the fathers of the Church were hostile to the use of pagan classics as a means of education. They feared an inroad of paganism. Yet most of the fathers approved of the cultural value of the study of the ancients, so long as the humanism of antiquity was not allowed to tarnish the beauty of Christian faith and morality; and the popes at the dawn of the Renaissance followed the example of fathers so illustrious.

3. *Valla* (1405–57) — In the course of time some of the Italian humanists became fanatical propagandists of heathenism, but there were ever contemporary scholars who clung to Christian ideals. Lorenzo Valla, ‹De Voluptate› (1431), presents an accurate picture of the false and true Renaissance of the times. The characters of his dialogue are historical personages. Lionardo Bruni tries to effect a harmony between Christianity and Stoicism. Niccolò Niccoli is a Christian humanist who defends the agreement of faith and science. Antonio Beccadelli, an Epicurean and the mouthpiece of Valla, teaches the gospel of pleasure, the gratification of every sense. Through him Valla defends the indulgence of all the appetites. Women have no rights. Adultery is the natural thing for man and woman. Continence is a crime. Sensuality is the highest good. Voluptuousness is an act of worship. Besides championing all this paganism and immorality, Valla wielded his trenchant pen against monasticism, the clerical state and what was called «tyrannical priestly domination.» His invectives against the papacy were most virulent; and yet this pagan humanist, because of his masterly Latinity, was favored by the popes. Nicholas V made him *scriptor* in the Vatican Library and later on papal secretary, and used his genius for the translation of Greek classics. Valla fawned and cringed, like others of his class, with such success as to receive from Callixtus III a canonry in Saint John Lateran. The papacy of the Italian Renaissance rather favored than opposed the pagan humanists in order to use their brilliant attainments in the cause of learning. Valla's contemporary, Antonio Beccadelli of Palermo, would scarce have been condemned by Eugenius IV had not his ‹Hermaphroditus› glorified the lowest degradations of unmentionable lust.

4. *The Height of the Italian Renaissance* (1453–1527).— The University of Paris had become a papal foundation in 1211. Twenty-eight universities, in various parts of Christendom, received papal charters between 1400 and 1506. The papacy was the main power that brought the Revival of Learning to the height of its glory. Nicholas V (1447–55) founded the Vatican Library, as a means of making Rome the centre of literary culture to the world. At his death, it contained 824 Latin and 352 Greek manuscripts. Among these latter was the famous Vatican Codex, B, of the Greek Bible. The fall of Constantinople (1458) occasioned a rich harvest of manuscripts for the Vatican Library. By 1484, at the death of Sixtus IV, it had a thousand Greek manuscripts of which 58 were Biblical. The library of Saint Mark's, Venice, which Cardinal Bessarion enriched, and the Laurentian Library of Florence belong to the fruitage of the Italian Renaissance. The art of printing soon reached Italy. With papal

approval, the printed Latin Vulgate edition of the Bible was spread broadcast. Between the years 1450 and 1500, there were 177 complete editions of the Vulgate printed: 134 in the Latin original, 15 in German, 13 in Italian, 11 in French, two in Bohemian, one in Dutch and one in Spanish. It is a sign of the vigor of the Christian Renaissance that no classic of ancient Rome was printed, until some 12 editions of the Latin Bible had been put through the press. In 1475 the Venetian Vulgate was issued. The Aldine Press of Venice, between 1494 and 1515, printed 33 first editions of Greek classics. Aldus issued the Septuagint in 1518. The Hebrew Bible was printed at Soncino (1477) and Naples (1486). Meantime, in the papal court, the false Renaissance was represented by the ribaldry and innuendo of Poggio, Filelfo, Æneas Sylvius Picolomini (later converted and raised to the pontificate as Pius II), and Cardinals Bembo and Bibbiena. Vain were the efforts of Giannozzo Manetti, Lionardo Bruni, Ambrogio Traversari, Gregorio Corraro, Maffeo Begio, Vittorino da Feltre, and a host of Christian scholars, to stem the tide of paganism. Vain was the thundering of the Franciscan and Dominican friars against the obscenity and filth of the false Renaissance. High ecclesiastics and even popes pampered and supported the ribald set. In the end, Leo X (1513–21) encouraged the abuses which he should have reformed. Had he done his duty, the Church would not have been dealt the severe blow of the Protestant Reformation. He himself was temperate; and yet revelry and carousing were characteristic of his court. The looseness of morals at that court are witnessed to by such immoral plays as Bibbiena's ‘Calendra’ and Ariosto's ‘Suppositi.’ Leo encouraged art and letters; but was a mere dilettante, and a dupe to profligates of the false Renaissance. Shortly after the death of Leo X, the sacking of Rome by a Lutheran army brought the Italian Renaissance to a close.

5. *Fine Arts.*— Long before the Revival of Learning, supposed to have been a Renaissance of Latin and Greek forms in letters, the fine arts had reached a high degree of perfection in Italy. Petrarch had not yet made his journeys in quest of manuscripts. Dante (1265–1321), the glory of mediæval Italian literature, had not written his «Divina Comedia.» Yet the cathedrals of Pisa, Lucca and Pistoia were completed. The basilica of Assisi stood in all its splendor, to be beautified by the frescoes of Giotto (1266–1337). Says Taine: «There is nothing like it. Before seeing it, one has no idea of the art and genius of the Middle Ages.» There is no harking back to antiquity on the part of the Italian painters of the 13th and 14th centuries. Christianity provides their subjects. The inspiration of Quattro Cento art is that of Catholic devotion. Cimabue (1240–1301) and his contemporary Duccio produced Madonnas that are masterpieces both in conception and execution. The exquisite draperies, filmy veils, aerial lightness and heavenly grace of Botticelli (1447–1510), a penitent of Savonarola, breathe not a pagan emotion. And as one gazes in rapture on the wondrous Annunciation and other frescoes in San Marco, Florence, one realizes the reasonableness of the story that the brush of Fra Angelico (1387–1455) was guided by eyes that saw through tears of love and devotion for the Madonna and her Child. Even the Cinque Cento plastic art of Italy shows by no means a rebirth of classic forms. There is individuality of self-expression in the painting of Raphael, Da Vinci, Titian and Correggio; and in the sculpture of Donatello and Michelangelo. Only in architecture is an attempt made at a rebirth of antiquity. The result is a hybrid Roman form, which later on becomes still more grotesque by the accretion of barocco vagaries.

**II. Outside of Italy.**— The influence of the Italian Renaissance reached Germany, France, the Netherlands, England and Spain by various and at times devious ways.

1. *Germany.*— Greek, Latin and Hebrew were brought into prominence among Teutonic peoples by traveling professors, and by students who attended Lombard and Tuscan Renaissance schools. The new learning was still wider spread through the establishment of universities and the invention of printing. The religious orders favored the press from the outset. Marienthal (1468), Saint Ulrich at Augsburg (1472), and the Benedictines of Bamberg (1474) did pioneer work in the printing and distribution of literature. The first book printed by Gutenberg, the inventor of the art, was the beautiful «42 line Bible» (1453–55), an edition of the Vulgate that is still extant. The Latin Vulgate was by far the best seller of the times. Most scholars then understood Latin; it was their common medium of epistolary intercourse. The needs of the few, who read German but knew not Latin, were amply met by the printing of the Bible in the vernacular. We still have copies of 18 complete editions of the Bible, printed in German between 1466 and 1521. The publication of Luther's Bible in 1522 was not due, as is too often said, to the lack of a translation that the uneducated could understand; but to Luther's revolt from the teaching and authority of the Church. (Consult Nestle, ‘Urtext und Übersetzungen der Bibel’ 1897, pp. 124 ff.). This revolt had nothing in common with the rebirth of heathen ideas in Italy. The revival of learning in Germany was from the very outset opposed to the pagan humanism of the peninsula; and yet it but led up to the same disregard of authority in religion as characterized Valla, Poggio and «the poets,» as they were styled. This spirit of revolt against papal authority did not at first appear. Rudolf Agricola (1443–85) was an eminent classical scholar and a devout Catholic. The Latinist von Langen, and the educationalist Wimphelung united Christian principles with a love of antiquity. On the eve of the Reformation Reuchlin was defended by Rome in the use of Hebrew and Septuagint readings for the proper interpretation of Holy Writ. Then came Luther, and in his wake Melanchthon, Zwingli and Calvin. They were learned, but not large minded. Though keen sighted enough to note the degradation of the court of Leo X, they failed to see that the reformation of ecclesiastical discipline had to be brought about by established authority. They broke loose from that authority; and in theory substituted freedom of private interpretation of the Bible instead of the authoritive teaching of the Church. In reality, Luther attempted not only to topple over the papacy from its power, but to set himself in the stead of the Pope. His was a masterful personality. In translating Romans iii, 28,

he interpolated the word *alone:* «For we account a man to be justified by faith *alone* without the works of the law.» Catholics found fault with the interpolation. He badgered them, and wrote: «When your papist gives himself useless trouble about that word *alone,* just tell him prudently: ‹Dr. Martin Luther wills it so and says «Papist and jackass are one and the same.» Sic volo, sic jubeo'; sit pro ratione voluntas. We would not be the pupils and disciples of the papists, but their masters and lords. We, too, would strut it a bit, and be arrogant with these donkies, and as Paul makes boast against his crazy saints, so I make boast against these my jackasses. Are they doctors? So am I. Are they learned? So am I. Are they preachers? So am I. Are they theologians? So am I. Are they controversialists? So am I. Are they philosophers? So am I. Are they dialecticians? So am I. Are they teachers? So am I. Do they write books? So do I. And I will go farther in my boast: I can explain the Psalms and the Prophets. They cannot . . . Why, if there be only one among them that can understand aright a foreword or a chapter of Aristotle, I am ready to be tossed in a blanket. I do not exaggerate . . . Be minded no longer to give to such jackasses other reply to their useless chatter about that word *alone,* than again and again to say: ‹Luther will have it so, and says he is a doctor greater than all the doctors of the whole of popery›» (Sendbrief von Dollmetschen, Luther's works, Weimar edition, 30, 2, p. 635: Erlangen ed. 65, p. 107). No wonder Harnack speaks of «the curious logic of Luther's arguments, the errors of his exegesis, and the unjustifiableness and barbarity of his polemic» (Dogmengeschichte, Vol. III, 4, p. 817).

2. *France.*— The conquest of Naples by the French king, Charles VII (1494), marks the beginning of the inflow of Renaissance ideas from Italy into France. The house of Valois ever and anon urged its claims to certain Italian provinces. Military expeditions over the Alps as well as the intervening peaceful relations with the Italians brought about in France a shifting of the nobility and the learned to Italian culture and ideals. The spring-tide of the French Revival of Learning was not antagonistic to the teaching and authority of the Church either in the direction of the paganism of Italian ultra-humanism or along the way of Luther's revolt. Aleandro, an Italian lecturer on Latin, Greek and Hebrew early in the 16th century, became rector of the University of Paris, and wielded a powerful influence against Luther. The Sorbonne was in those days a leader at once in science and in orthodoxy. It condemned the Bibles of Estienne, because they lacked annotations from approved Catholic sources. The first critical editions of the Greek New Testament were those of the devout Catholics Simon de Colines (1534) and Robert Estienne (1st ed., 1546; 3d ed., 1550; 4th ed., 1551). The latter was the first to publish an *apparatus criticus* for the restoration of the New Testament text. French poetry takes on a new form in Marot, Ronsard and their followers. The first French humanists to go the way of Boccaccio and his set are Rabelais (c. 1490–1553) and Montagne (1533–92). The former was a priest and a physician; he is known chiefly for the masterful style of his indecent, satirical, humorous and brilliant Epicureanism. Montaigne, the elegant essayist, sets a pace of hostility to the Church and her institutions that has been kept up in France until this day. The most decided return to classic forms is seen in poets, essayists and preachers of a century later — Fenelon, Racine, Corneille, Bossuet, Massillon, Bourdaloue — all devoted Catholics. Pointed architecture had reached the height of its glory in France during the 13th century; it became florid, perforated, embroidered, in the *style flamboyant* of the 15th century; and the Renaissance introduced forms that, though deprecated by lovers of Gothic, were the natural evolution consequent upon the inroad of Italian ideas into the valley of the Loire. In painting, there is not a real French Renaissance school; the work of Claude and the Poussins is of the early modern period.

3. *The Netherlands.*—In the Low Countries, Renaissance architecture pales by the side of mediæval structures. The Van Eycks, Memling, Metsys and others surpassed in their oil coloring; but painting does not reach its glory in the Flemish and Dutch schools until the 17th century. The exquisite sepias of Rembrandt, the gorgeous coloring of the all too sensuous Rubens, the heavenly beauty of Vandyck, the light effects of Ruysdael and Cuyp will ever be the objects of enthusiastic admiration. In letters the critical work of Lipsius and Grotius is to be grouped with the marvels of the Elzevir and Plantin presses. The greatest humanist of the Netherlands was Erasmus. That he was a loyal Catholic is clear from his opposition to Luther; an excellent edition of the works of Saint Jerome (1516), the first critical work done in this Patristic field; and an edition of the Greek New Testament (1516). This latter was not critical. Erasmus relied on a few late manuscripts. For the Apocalypse he had only a single, imperfect codex. So the Dutch scholar went the full length of boldness; he garbled the text and filled in with his own translation from the Vulgate when the original Greek source could not be deciphered or was deemed to be wrong. Some of these readings of Erasmian coinage found their way into the *textus receptus,* were borrowed from the Dutch workbasket by Luther and appear in the Greek Testament of the British and Foreign Bible Society as well as the Authorized Version. Erasmus is merciless and sarcastic in attacking the extravagances of the schoolmen and the abuses that existed among the clergy; but he must be interpreted in the spirit of the times. His lasting and close friendship for Blessed Thomas More, after whom the ‹Praise of Folly› (‹Moriæ Encomium›) is playfully entitled, suggests a far greater loyalty to the Church than one might conclude from the invectives and pitiless spirit of that work, the ‹Adagia› and the ‹Colloquia.›

4. *England.*—Among the English humanists were More, Blessed Cardinal Fisher, Hadley, Linacre, Colet and Fox. Blessed Thomas More, chancellor of the realm, martyred for refusal to take the oath of the supremacy of Henry VIII over the Church in England, was scholarly, witty, learned, an adept in Latin style, and perhaps the best example of Renaissance English

extant in our literature. Though later Elizabethan English became classic, the clearness, strength and elegance of More must be admitted. His ‹Utopia› is entirely free from any humanistic slavishness of imitation and shows a firm grasp on social and religious problems of the day. More is not sparing of whatsoever he found to be unbecoming in ecclesiastics, yet his writings breathe a noble, truly Catholic spirit. The revolt of England from the Church cannot be attributed to a freedom of private judgment, which infiltrated from Italy. The germs of this spirit were long developing in England. Witness the conflict between the papacy, represented by Saint Anselm, Primate of England, and the Norman kings, William Rufus and Henry Beauclerc, during the 11th and 12th centuries. Chaucer (1340–1400) was influenced by Italian models, but long preceded the Renaissance in England. Wyclif (1335–84) and the Lollards of the 14th and 15th centuries anticipated the Lutheran Reformation by more than a century in the substitution of simple Bible reading for the authoritative teaching of the Church. The so-called Wyclif Bible, assigned to 1380, which was used by the Lollards, was a translation from the Latin Vulgate, probably of Catholic and not Wyclifite origin (consult Dom Gasquet, ‹The Old English Bible,› pp. 102 ff.). Tyndale (1484–1536) showed some influence by the Reformation in Germany; but when his Bible was issued (1525), it by no means marked the beginning of England's movement away from the authority of the Catholic Church.

5. *Spain.*—During the Renaissance, in Spain, architecture added Arabic features to classic forms; sculpture showed strength and individuality; painting developed apace, until the great 17th century masters, Murillo and Velasquez, rivaled the best work of the Italian Renaissance. Cardinal Ximenes published his monumental Polyglot Bible (1514–22). Spanish prose reached its high-water mark in the humorous and refined Cervantes (1547–1616), whose ‹Don Quixote› (1605–15) is unsurpassed in the world's literature for masterful, withering, witty, yet courteous taunts at the evils of the day. Dramatic poetry culminated in the voluminous Lope de Vega (1562–1635), to whom 1,500 plays are accredited, and the renowned Calderon de la Barca (1600–81). In objectivity, freedom from lyric self-unfolding, breadth of vision, interest of plot and counterplot and power of dramatic expression, only Shakespeare and the Greek dramatists surpass these two Spanish poets. Along with them should be mentioned the ‹Lusiad› of the Portuguese Camoens, who was the first modern epic poet to use a modern theme for his epos and to cut free from ancient trammels in the treatment of his theme. The Spanish and Portuguese Renaissance also expressed itself in exploration and colonization. Columbus, Vespucci, Diaz, Vasco da Gama, Cortez, Pizarro and many others bear witness to the intrepidity and greatheartedness that characterized these Catholic nations. There was in those days an effective league of nations. By common consent of Catholics throughout Europe, the popes had for centuries been the arbiters in national and international disagreements. It was by this overlordship that Nicholas V (1454) conceded to Portugal the right of colonization from Africa to India; and Alexander VI (1494) divided the Indies into East or Portuguese and West or Spanish.

**III. Counter Reformation.**— The Italian pagan Renaissance ended with the sack of Rome by German Lutherans (1527). Its churches were desecrated and libraries pillaged. The papacy was aroused from the lethargy of Leo X. The Counter Reformation began; it was late but most effective. The Council of Trent, the Roman Index and the Society of Jesus were mighty forces in effecting the needed reform of ecclesiastical discipline. (See JESUITS; LOYOLA; INDEX LIBRORUM PROHIBITORUM; TRENT. At the end of the 16th century, chiefly because of the missionary activities of the great religious orders, the Church had so recovered from the staggering blow of the Reformation that the faithful outnumbered those of pre-Lutheran times, and an age of strict religious observance set in.

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**RENAISSANCE DECORATION.** See INTERIOR DECORATION.

**RENAISSANCE PAINTING.** In central and northern Italy, in the 14th century, the *Giotteschi,* or scholars and imitators of Giotto, soon lost the inspiration and initiative of his art. His great principle of the direct study of nature was much neglected; portraiture, which he had undertaken with imperfect knowledge, became a distinct branch of the art only in the 15th century; and the landscape sentiment was as yet undeveloped. Nevertheless, the seeds of the great awakening of the human intellect, which brought with it a knowledge of antique art and a new intimacy with both Nature and contemporary man,— and a consequent development of all the arts,— were germinating; it appeared almost in the first decade of the 15th century in both Italy and the Netherlands. For this Renaissance, the art of painting presented the most favorable means of expression, of rendering the spiritual rather than the merely corporeal, the intangible as well as the appearance of reality; and also as an outlet for the individuality which had been so long smothered under formulas and conventions. Rather curiously, this restoration of a long-lost art began, among the Flemish painters, with a suddenness, a completeness, which it was impossible to maintain,— the first great work which figures in the history of this restoration, the great altar-piece in the church of Saint Bavon in Ghent, painted by the brothers Huybrecht (Hubert) and Jan van Eyck (q.v.), is an example of completeness of pictorial representation, spiritual and technical, which the survivor of these painters himself was not able to equal in his other works. The mastery seems complete even of the new process of oil painting, which they are generally credited with having first practically employed. (See Oil Painting). Contemporary with this Flemish school of Bruges and Ghent was another of Brabant, with the centre in Brussels, founded by Rogier van der Weyden (q.v.) similar in tendencies. Holland developed an independent school, at Haarlem, the chief of which was Dierick Bouts (d. 1475), whose works show the influence of Van der Weyden, but are marked by somewhat greater luminousness and richness of color and display a knowledge of aerial perspective in landscape. In the paintings of Hans Memlinc (q.v.) of Bruges many of the archaic qualities of his predecessors disappear and are replaced by a greater suavity and feeling for beauty. The influence of the Van Eycks extended down to the end of the 15th century, and Flanders was the seat of a great artistic production, painters and students passing backward and forward between her borders and those of Italy. In France, in the latter part of the century, there was a northern school and a smaller one in Provence, at the court of René d'Anjou; but the important paintings of this period were nearly all destroyed in the religious wars and the Revolution, and our knowledge of the art is derived chiefly from the miniatures.

The patronage which had been extended to the new art in the Netherlands, by princes, corporations, the Church and private individuals in the 15th century, was continued in the early years of the 16th. Foremost among the important representatives of the Northern spirit was Quinten Massys (q.v.), or Massijs, of Antwerp (d. in 1530). Jan Gossart (q.v.), called Mabuse, from his native town of Maubeuge in Hainault, on the contrary, after his journey to Italy, adopted many of the characteristics of the Southern painters, which found favor in the eyes of his countrymen. The Dutch painters of this period were numerous; the first to become widely known abroad was Lucas Jakobsz, called Lucas van Leyden. The movement toward realism and naturalism was slower in the schools of Germany, the chief of which was that of Cologne; the earliest important work now extant is the large altar-piece, a triptych known as the *Dombild,* painted by Stephen Lochener (d. 1451). The painters of this school substituted for the pictorial or distant backgrounds of the Flemings generally a flat, gold one and they differed from them also in the retention of the disc-shaped nimbus behind the heads. The Swabian school, chiefly Alsatian, was distinguished by a remarkable artist, a bold innovator, Martin Schongauer, the greatest master in Germany of his time, but now best known by his drawings and engravings. The schools of Ulm, Nördlingen and Augsburg were more or less influenced by the Flemish art; two families of painters, the Burckmairs and the Holbeins, combined to raise the fame of Augsburg to the highest degree. In both, an illustrious father was succeeded by a still more illustrious son,— Thoman Burckmair by Hans (q.v.), and Hans Holbein, the elder (q.v.), by his famous son of the same name. The latter, and his brother Ambrosius, are found in Basel in 1515–16. As the most brilliant representative of the German Renaissance, Hans Holbein, the younger (q.v.), rose superior to the limitations of the art of his time and excelled in all branches. His large mural paintings have all been destroyed; but the votive picture executed for the family of the Burgomaster Meyer in 1526, his portraits — including those of the period of his sojourn in England at the court of Henry VIII — and his designs and engravings, have been preserved. From the Franconian school, of which Nuremberg was the centre, came the most formidable of his rivals, Albrecht Dürer (q.v.), a pupil of Michael Wolgemut, painter of altar-pieces and of careful portraits and a skilful wood-engraver. The influence of Nuremberg was diffused over a wide area,— Schleswig, eastern Germany, Bohemia and Poland.

In the north of Europe, the spirit of the Renaissance lagged somewhat behind as compared with its development under the sky of Italy. Climatic conditions, the influence of the Gothic in making angular the forms and the draperies and in diminishing the wall spaces for mural painting, a neglect of the close study of the human body, of proportion, of perspective, a general empiricism in the sciences, the scarcity of examples of antique art, a lack of intelligent and munificent patronage in Germany, even the Reformation itself,— all have been given as partial explanations of this inferiority. Notwithstanding his genius, his earnest researches and his journey to Italy, Dürer's art remained hampered throughout his life by his mediæval limitations. The Italians, who fully appreciated his work, his imagination and intellectual power, declared that he would have been as great as the greatest of their own artists if they had been born in Florence or Rome and had studied the antique. His great influence over his contemporaries was extended by his engravings. Dürer's chief rival among his contemporaries was Albrecht Altdorfer, the Ratisbon master. Lucas Cranach, the elder, so called from his natal town in Franconia, established a school in Saxony, which survived for some years after his death, although unable to reproduce his strong individuality. In Upper Alsace, the renown of Martin Schongauer was continued by two painters, not natives of the province, Matthias Grünewald and Hans Baldung, the latter, also, betraying strongly the influence of Dürer. The school of Swabia, the most eminent and the most learned of the German Renaissance, boasted, in addition to the Burckmairs and the Holbeins, of Martin Schaffner, the so-called Master of Ulm and some other painters. In the Spanish peninsula, at the period of the gradual expulsion of the Moors, the demand for church pictures brought painters from both Italy and Flanders,— from the latter, among others, Jan van Eyck and Rogier van der Weyden.

Among the causes that contributed to the development of the full flower of the Renaissance in Italy,— in addition to those already mentioned,— may be cited the humanistic spirit, derived largely from the enthusiasm arising from the study of the antique, a general aspiration toward the noble and the beautiful, a new ideal of humanity. Contemporary with this was a revival of learning,— more complete than in Germany. The art of painting, however, it was necessary to reinvent; the study of the human figure, the all important subject in the art of the Renaissance, was undertaken scientifically. Church painting remained for a long time the principal feature and it was greatly favored by the abandonment of the old Gothic Type and the division of the field into panels — which permitted of larger wall spaces, of pictures even longer than they were high. These were executed in fresco, the method perfected in the school of Giotto,— *buon fresco,* painting on the last or smooth coating of plaster freshly applied to the wall and while still wet. That which could not be painted upon in the course of the day was cut out and replaced with fresh lime the next morning. In this manner the color becomes an integral part of the wall. The pigments were water colors, usually earths and minerals. Subsequent retouching was necessarily done *al secco,* on the dry wall and this was generally considered regrettable and somewhat dangerous to the conservation of the painting. Sometimes in the contracts for decorative works we find this retouching insisted upon. Encaustic paintings seems also to have been known; tempera and oil painting were usually reserved for altar-screens and easel pictures, these being generally panels covered with a thin layer of plaster. For their studies and drawings, the artist worked in monochrome or *gris aille,* called by the Italians painting in *chiaro oscuro;* their colors were ground by their apprentices under their own eyes and selected with great care. The art of painting, the most eloquent expression of the Renaissance, was destined to outstrip the other manifestations — sciences and letters, if not architecture. Florence remained the chief seat of this art in the 15th century as in the time of Giotto, though her authority was much less than in sculpture; the leaders were Masolino and his pupil Masaccio (q.v.), to the latter is attributed the honor of having invented a new style in painting. Very different from his intelligent naturalism and fine sense of distinction was the sincere and naïve piety of the work of the Dominican friar Fra Giovanni da Fiesole (q.v.), called Fra Angelico; and still more so the tasteless «realism» of Paolo di Dono, known as Paolo Uccello (q.v.). Foremost amongst the direct heirs of Masaccio were Fra Filippo Lippi (q.v.), and his son, called Filippino Lippi (q.v.); the paintings of the former betraying new qualities of color and of *morbidezza.* With him originated a new type of the Madonna, afterward given its highest expression by Leonardo and Raphael,— a presentation in which only the human idyl of motherly love and infantile innocence is sought. In the religious as in the allegorical and mythological subjects of Sandro Botticelli (q.v.), something of the mediæval awkwardness of expression reappears, redeemed by the grace and charm of the conception and the color. With him are associated as exponents of a modern, ingenious spirit, Benozzo Gozzoli, a pupil of Fra Angelico and Pinturicchio (q.v.). Andrea Verrocchio (q.v.) is most popularly known as a sculptor, principally by his equestrian statue of Colleone, the Venetian general; Domenico Ghirlandaio (q.v.), less original than Masaccio but more finished in his expression of realism, was, next to him, the most important painter of the Florentine school of the 15th century and had for a pupil Michelangelo.

Of the Umbrian school, the chief seat was Perugia, though in this province painting was not centralized in the cities; the mystical and serene spirit of Perugino differed from the vivacious and investigating character of his predecessors in the school. The first artist to feel the influence of Florence was Piero degli Franceschi (q.v.), but a more skilful was Luca Signorelli (q.v.), his pupil, whose great painting of the ‹End of the World,› in the chapel of the cathedral of Orvieto (which had been commenced by Fra Angelico), furnished themes and figures to Michelangelo for his ‹Last Judgment.› In the best works of the master of Raphael, Pietro Vanucci (q.v.), called Perugino, may be seen the same art, the same suavity and dignity, which characterize much of the early work of his famous pupil; he seems to have been the first in central Italy to master completely the new process of painting in oil.

In northern Italy, the most important centre of the arts was at Padua, the school there having been founded in the second half of the 15th century by Francesco Squarcione (q.v.), known as the «Father of Painters,» and the discoverer of the genius of Andrea Mantegna (q.v.), whom he adopted at the age of 10. In this latter artist, one of the most learned, ingenious and original of his age, the first to master the complete rules of composition, the study of nature was happily balanced by a corresponding study of the antique. In Venice, enjoying a most unusual order and prosperity under the intelligent despotism of her dukes, the revival of art did not manifest itself strongly until the second half of this century, but its final florescence was one of the most brilliant of any age. Two families of painters appear in this first period, the Vivarini and the Bellini, the latter much the more famous. To them Antonello da Messina seems to have communicated the method of painting in oil, which they so soon mastered,— a love of color and splendor being one of the natural gifts of the Venetians. The head of the family was Jacopo Bellini (q.v.), who went to Florence early in his career; his sons were Gentile (q.v.) and Giovanni (q.v.), the latter praised by Albrecht Dürer at the period of his visit to Italy in 1506. In the works of these Venetians appears that «atmosphere» which is so diligently sought by the modern schools,— the feeling of space and air, of the relative position and value of the figures in the general arrangement; the Gothic angularity and awkwardness have been replaced by a fuller knowledge. The most eminent of the followers of Gentile Bellini was Vittore Carpaccio (Scarpaccia), famous for his cycle of nine pictures illustrating the legend of Saint Ursula.

The greatest name in the Renaissance proper is that of Leonardo da Vinci (q.v.), b. 1452, distinguished as a scientist, an architect, a sculptor, a musician, an author and a painter,— and qualifying painting, himself, as the noblest of the arts and as at the same time a science. But few of his pictures survive, the most famous and the most wonderful being the portrait known as the ‘Mona Lisa’ in the Louvre. Of his numerous followers, the most productive and the most successful in expressing some of his qualities was Bernardino Luini (q.v.). Michelangelo (q.v.), on the other hand, vehemently protested against placing painting on a level with sculpture, and, indeed, remained to the end of his days “*Michelangiolo Scultore*” rather than the painter, even in his greatest mural decorations. His first patron was Lorenzo de Medici; and it was in 1508 that the Pope Julius II commissioned him to paint the ceiling of the Sistine Chapel in the Vatican. In 1535 he began the ‘Last Judgment’ on the end wall, and it was unveiled for the Christmas festival of 1541. The qualities of his rugged genius were peculiarly those best adapted to create a school of mannerisms and conventions among his imitators, and we see his influence very strongly developed even in his lifetime, and even in the favorite pupil of Raphael, Giulio Pippi, called Giulio Romano (q.v.). To this pretentions and ignorant school of exaggerated muscular action and violent fore-shortening, which flourished during the decadence of the art, was given the name of the Baroque. The art of Raphael Santi da Urbino so different in quality, was eminently qualified by its combinations of academical distinction with suavity and grace to secure the largest need of popular favor in his own time and in succeeding ages, and his ‘Madonna Sistina,’ now in the Dresden Gallery, was accepted for more than three centuries as the greatest painting in the world. Andrea del Sarto (q.v.), the best colorist in the Florentine school, may be said to err only in a certain lack of deep feeling; and the versatile talent of Correggio (q.v.) leads up to the splendors of the later Venetian school of Giorgione, Palma, Vecchio and Titian, and, later still, of Paul Veronese, Tintoretto and Tiepolo, the apotheosis of the beauty of oil painting. Giorgio da Castelfranco (so great a Giorgio that he was called Giorgione, that is, Big George) was a fellow student with Titian under Giovanni Bellini. But very few of his authenticated works survive, one of them being in the Louvre. Of Giacomo Palma, the elder (q.v.), called Palma Vecchio, more is known, over a hundred existing paintings being attributed to him, the finest being probably the altar-piece of Santa Maria Formosa, Venice, a single figure of Saint Barbara. With the majestic figure of Titian, Tiziano Vecelli da Cadore (q.v.) (1477–1576), the golden period of the Renaissance may be said to end,— of all the numerous assistants who worked under him during his long life, including a brother and a son, none inherited his power. His paintings, sacred, allegorical, mythological, and portraits, are preserved in all the great galleries of Europe; the most beautiful, and perhaps the most characteristic of this school being the so-called ‘Earthly and Heavenly Love’ in the Borghese Palace in Rome. For painting after 1550, see POST-RENAISSANCE PAINTING.

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**RENAN**, rē-näṅ, **Ernest**, French historian, philosopher, dramatist and essayist: b. Tréguier, Cote-du-Nord (Brittany), 27 Feb. 1823; d. Paris, 2 Oct. 1892. The priests who directed the school in Tréguier conducted his education up to his 16th year. When he was chosen in 1838 by the Abbé Dupanloup for a place in the seminary of Saint Nicolas du Chardonnet in Paris. Here he remained until, in 1842, he went to Issy, near Paris, to receive a training in philosophy previous to his entering upon his studies for the priesthood. In 1844 he was admitted to the seminary of Saint Sulpice, the chief training school of the French priesthood, where he acquired a knowledge of Hebrew, Arabic and Syriac. The result of these studies in philology was to shake his belief in Catholic orthodoxy, and finding it impossible to enter the priesthood he left the seminary in 1845. While he now maintained himself by teaching in a school at Paris, he continued his historical and philological studies, aided by the counsel and assistance of his sister, Henriette. In 1848 he received the Volney prize for an essay on the Semitic languages. This was amplified and published as ‘Histoire générale et Système comparé des Langues sémitiques’ (1855). In the following year he was sent on a mission to Italy by the Académie des Inscriptions et Belles-Lettres, and returning was appointed to a post in the manuscripts department of the Bibliothèque Nationale. His ‘L'Avenir de la science,’ though not published until 1890, was written in 1848–49. He next published ‘Averroès et averroisme’ (1852) and several ‘Etudes d'histoire religieuse’ (1856). Having become known as an Oriental scholar, he was appointed a member of a commission sent by the government in 1860 to examine the remains of Phœnician civilization in Syria. It was during this journey in Palestine that he wrote his famous ‘Vie de Jésus’ (1863). He afterward dedicated it to his sister, Henriette, who, having accompanied him, had died at Byblos. During his absence Renan had been appointed professor of Hebrew in the Collège de France, but some expressions of a Unitarian character in his inaugural address conspired with his well-known hostility to traditional Christianity to deprive him of his chair, in which he was not reinstated until 1871.

The publication of the ‘Life of Jesus’ in 1863 gained for its author a European reputation, and was the first of a series on the ‘Histoire des Origines du Christianisme,’ which he made the chief labor of his life. This comprehensive work included the following further volumes: ‘Les Apôtres’ (1866); ‘Saint Paul’ (1869); ‘L'Antichrist’ (1871); ‘Les Evangiles et la seconde génération Chrétienne’ (1877); ‘L'eglise Chrétienne’ (1879); ‘Marc Aurèle et la fin du monde antique’ (1882); ‘Index général’ (1883). In 1888 he was elected a member of the French Academy. During 1880 he delivered the Hibbert lectures in London on ‘The Influences of the Institutions, Thought, and Culture of Rome on Christianity,’ and also, at the same time, lectured at the Royal Institution on Marcus Aurelius. In 1883 he was appointed administrator of the Collège de France, where he continued his labors until his death. It is not yet possible to decide with any degree of certainty the ultimate effect of his work on the religious thought of Europe. Around Renan's writings were waged bitter controversies «whose volume is rivaled only by their acrimony.» Truth was to him a diamond of many facets, and he was never ready to define his position, but to his own generation he was a man of unique personality, and a writer of great erudition. Besides the works already enumerated the following should be mentioned: ‘De l'Origine du Langage’ (1857); ‘Le livre de Job’ (1859); ‘Essais de morale et de critique’ (1859); ‘Le cantique de cantiques’ (1860); ‘Mission de Phénicie’ (1865–74); ‘Questions contemporaines’ (1868); ‘La réforme intellectuelle et morale’ (1872); ‘Dialogues philosophiques’ (1876); ‘Mélanges d'histoire et de voyages’ (1878); ‘Corpus inscriptionum Semiticarum’ (1881–89); ‘L'Ecclésiaste’ (1882); ‘Souvenirs d'enfance et de jeunesse’ (1883); ‘Nouvelles etudes d'histoire réligieuse’ (1884); ‘Discours et conférences’ (1887); ‘Histoire du peuple d'Israël’ (1887–94); ‘Feuilles détachées’ (1892); and several dramas, such as ‘Caliban’ (1878). ‘L'eau de Jouvence’ (1880), Le prêtre de Nemi’ (1885) and ‘L'abbesse de Jouarre’ (1886). His ‘Lettres intimes’ (1896) are a fitting memorial of his devoted attachment to his excellent sister, Henriette. See LIFE OF JESUS; RECOLLECTIONS OF CHILDHOOD AND YOUTH.

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**RENÉ**, rė-nā, or **RENATUS I** (rĕ-nā'tŭs) **OF ANJOU** (called also THE GOOD), titular king of Naples: b. Angers, 16 Jan. 1409; d. Aix, 10 July 1480. He was the second son of Louis II, Duke of Anjou. He inherited Anjou and Provence, besides claims upon Naples, Sicily and Jerusalem from his brother Louis III in 1434, and these rights were confirmed by Joanna II before her death in 1435. René had in 1420 married the daughter of Charles II, Duke of Lorraine, and had in 1431 become possessed of that dukedom. But in the same year Count Antony of Vaudemont took him prisoner, whereupon the Lorraine states appealed to the Emperor Sigismund to decide the quarrel. René in 1432 was released from his prison for a year by giving his sons as hostages. At last, in 1434, Sigismund gave a decision in Renés favor. The dethroned Antony proceeded to the Duke of Burgundy, who required René again to place himself in custody. Scarcely had this been done when an embassy arrived to tender him possession of Naples and Sicily. Philip refused to set René at liberty, and the ambassadors therefore conferred the crown on his wife Isabella, whom her husband named regent of Anjou, Provence, Naples and Sicily. Isabella set sail for Naples, but there found a competitor in Alfonso, king of Aragon, who maintained his position not only against her, but also against René himself, after he had obtained his liberty in 1437. René, obliged to abdicate, returned to Provence. The government of Lorraine he gave up to his son John, who, after his mother Isabella's death, entered into full possession under the title of John II. On this René retired to Provence to give himself to poetry and the arts. His literary remains were edited by Count de Quatrebarbes (1845–46). Consult also Boisson de la Salle, ‘Précis Historique’ (1820); Bargemont, ‘Histoire de René d'Anjou, Roi de Naples, Duc de Lorraine, et Comte de Provence’ (1825); Marche, ‘Le Roi René: sa vie et ses travaux’ (1875); Staley, ‘King René d'Anjou and his seven Queens’ (1912).

**RENÉ II**, count of Anjou, grandson of René I: d. 1508. He inherited Vaudemont, Joinville, Aumale, Mayenne and Elbœuf in 1470 from his father, Frederick II; and Lorraine from his mother in 1473. In 1480 he acquired the dukedom of Bar. He fought with the Swiss against Charles the Bold of Burgundy in 1477. After his grandfather ceded Lorraine to Louis XI he tried to establish his rights by force of arms.

**RENÉE OF FRANCE**, DUCHESS DE FERRARA, French princess, daughter of Louis XII: b. Blois, France, 1510; d. Montargis, France, 1575. She was highly educated, possessed a keen intellect and took a deep interest in religious controversies. In 1527 she was married to the Duke de Ferrara and in 1535 was converted to Protestantism by Calvin. Her conduct was displeasing to her father who caused her four children to be taken from her and educated in the Catholic faith, and also ordered severe restrictions concerning the princess' freedom of action and compelled her to attend mass. After the death of the duke in 1559 she returned to France and resided in her castle of Montargis, where she was the patron of the French Huguenots and also of various literary celebrities. Consult Vatteau-Calleville, ‹Vie de Renée de France› (1781); ‹Memorials of Renée of France, Duchess of Ferrara› (1859); Fontana, ‹Renata di Francia, duchessa di Ferrara› (1888–93); Rodocanachi, ‹Renée de France› (1896); Fawcett, ‹Five Famous French Women› (1905).

**RENEGADE,** one who renounces his religious belief and adopts another; in particular one who gives up Christian belief for Mohammedanism: a renegade is also a traitor who, deserting the cause of his country, enters the service of his country's enemies. Among famous renegades in this sense are Hippias, the Athenian, son of Pisistratus, who fought on the side of Sparta against Athens, and afterward joined the Persians; the Roman patrician Coriolanus, who, when exiled from Rome, took up arms with Volscians against his country; in the Thirty Years' War, Count Mansfeld, who deserted from the Catholic to the Protestant side, and Pappenheim, who deserted from the Protestant side to the Catholic; Archibald Campbell, Duke of Argyll, who in 1619 entered the service of Spain, then at war with Great Britain; the Cossack chief, Mazeppa, who fought against his sovereign at Pultowa with the Swedes; in the 18th century the Duke de Riperda, who had won distinction in the military service of Spain, but embraced Islam and led the armies of Morocco against Spain; Omar Pasha, hero of the Crimean War, born a Christian, who joined the Turks and embraced Islam; Emin Pasha, a hero of the Equatorial Province of Africa and a German Jew, who became a Mohammedan. At the outbreak of the Civil War in the United States, a considerable number of military and naval officers resigned office and entered the Confederate service.

**RENFREW,** Canada, town in Renfrew County, Ontario, on the Bonnechère River, eight miles above its confluence with the Ottawa River, 58 miles west of Ottawa, on the Grand Trunk and Canadian Pacific Railways. There is a large waterfall near here and the town has abundant water power. Manufactures include leather, flour, woolens, hosiery, refrigerators, machinery, and there are dairy and lumber interests. Pop. 3,846.

**RENI, Guido,** gē'dō rā'nē, Italian painter: b. Bologna, Nov. 1575; d. there, 18 Aug. 1642. His first instruction was received in Calvaert's celebrated school at Bologna where he studied the works of Albrecht Dürer. When the school of the Caracci, at Bologna, began to eclipse that of Calvaert, Guido, then 20, joined it. He visited Rome for the first time in 1602, with two of his fellow students, Domenichino and Albano. He made a second visit in 1605 and Cardinal Borghese employed him to paint a ‹Crucifixion of Saint Peter› (now in the Vatican) for the church Delle Tre Fontane. The powerful manner of this picture, and several others of the same period, which manner Guido did not, however, long retain, increased his fame; and at the cardinal's request, he completed the ‹Aurora› on the ceiling of the Casino in the Rospigliosi Palace. This picture has become well known and popular from the engravings of it by R. Morghen, J. Burger and others. Paul V at that time employed Guido to decorate a chapel on Monte Cavallo, with scenes from the life of the Virgin Mary. Guido accomplished this work to the satisfaction of the Pope, and was next entrusted with the painting of the memorial chapel in Santa Maria Maggiore. To this period his ‹Fortuna,› and the portraits of Sixtus V and Cardinal Spada may be assigned. His paintings are very unequal in style and character, but generally are considered as belonging to three different manners and periods. The first comprises those pictures which resemble the manner of the Caracci, and particularly that of Caravaggio. Faces and forms, stately and grandiose, deep shadows, narrow and intense lights, high coloring, in short, an effort after great effect, distinguish his works of this first period. The second manner is completely opposed to the first and shows the painter at his best, being sweet, natural and unstrained. Its principal features are tender coloring, little shade, an agreeable, though often too dainty, airy and sentimental, treatment of the subject, constituting a style quite peculiar to Guido. His ‹Aurora› forms the transition from the first to the second style of his paintings. A third period commences at the time when Guido worked with too much haste and had become more avaricious of money than of fame. His coloring has turned to a greenish and altogether unnatural grayness, and the general treatment is careless and weak. During the government of Pope Urban VII Guido quarreled with his treasurer, Cardinal Spinola, respecting the price of a picture, and returned to Bologna. There he had already executed his ‹Saints Peter and Paul› for the house of Zampiere, and the ‹Murder of the Innocents› for the Dominican church, and was on the point of embellishing the chapel of the saints with his pictures when he was called back to Rome, loaded with honors, and received by the Pope himself most graciously. But he soon experienced new difficulties, and in 1622 accepted an invitation to go to Naples. Believing himself unsafe at this place, on account of the hatred of the Neapolitan artists for foreign painters, he returned once more to his native city, never to quit it again. At Bologna he painted two beautiful pictures for the church Dei Mendicanti, an ‹Assumption› for Genoa, and a number of others for his native city and other places, particularly for Rome. There is also a ‹Magdalen› by this artist in Chiswick House, belonging to the Duke of Devonshire, of which there is an engraving by Sir Robert Strange. Equally celebrated is a painting of ‹Lot and his Daughters,› in the Hampton Court collection, also engraved. In the gallery of the Louvre are several, of which the finest is the ‹Centaur Nessus carrying off Dejanira.› In the Dresden Gallery is his ‹Christ Wearing the Crown of Thorns.› Consult Bolognini-Amorini,

‹Vita del celebre pittore Guido Reni› (1839); Dohme, ‹Kunst und Künstler Italiens› (Vol. II, 1879); ‹Masters in Art› (Vol. IV, 1903); Von Boehm, ‹Guido Reni› (in Künstler-Monographien,› 1910).

**RENNELL,** rĕn'ĕl, **James,** English geographer: b. Chudleigh, Devonshire, 3 Dec. 1742; d. London, 29 March 1830. At 13 he entered the navy as midshipman and was present at the siege of Pondicherry. In 1763 he entered the East India Company's sea service; the next year was appointed surveyor-general of the East India Company's dominions in Bengal and remained in the service for 13 years. Returning to England in 1777, he published his ‹Bengal Atlas› (1779), a work of the highest importance for administrative and strategical purposes. This was followed by the earliest approximately correct map of India, with a memoir (1783). The Royal Society, of which he had been a fellow for 10 years, gave him the Copley medal in 1791. His attention was thereafter directed to comparative geography, and in pursuance of his scheme for a great work on western Asia he published ‹Geographical System of Herodotus Explained› (1800); ‹Observations on the Topography of the Plain of Troy› (1814), and ‹Illustrations of the Retreat of the Ten Thousand› (1816). Finally came ‹A Treatise on the Comparative Geography of Western Asia› (1831). He contributed much to the field of African geography, constructing a map of northern Africa for the African Association, and determining the routes taken by Hanno and his own day by Mungo Park. Throughout his life he had been interested when not personally occupied in marine surveying and had collected an immense mass of data which he began to reduce to a system about 1810. He completed current-charts of the Atlantic which were published after his death; and the name of ‹Rennell's Current› was given to the current to the southward of the Scilly Islands whose occasional northward set he was the first to explain. He published papers on the ruins of Babylon, the identity of Jerash, the shipwreck of Saint Paul and the landing of Cæsar. In 1801 he was made an associate of the Institute of France, and in 1825 received the gold medal of the Royal Society of Literature. He was buried in Westminster Abbey. Consult Markham, ‹Major James Rennell and the Rise of Modern English Geography› (1895).

**RENNENKAMPF, Paul Charles von,** Russian general: b. Baltic Provinces, 1854; d. 1918. He was educated in a military academy, became a staff officer and in 1900 saw service in China as a major-general. He was commander of a division of cavalry in the Russo-Japanese War in 1904–05, and he was criticized for the harshness of his measures in dealing with the revolutionary disturbances in 1905. He took an active part in the early events of the European War, participating in the Russian invasion of East Prussia. He was removed from his command after his failure to prevent the Germans from entering Warsaw and was placed on the retired list. Author of ‹Der zwanzigtagige Kampf meines Detachements in der Schlacht von Mukden› (1909).

**RENNERT, Hugo Albert,** American philologist: b. Philadelphia, Pa., 6 May 1858. He was graduated at the University of Pennsylvania in 1876 and later studied at the University of Freiburg. He has been professor of romance philology at the University of Pennsylvania since 1892. He has written ‹Spanish Pastoral Romances› (1892); ‹Comedias of Miguel Sanchez›; ‹Poésies Quédites de Gongora›; ‹Life of Lope de Vega› (1904); ‹The Spanish State in the Time of Lope de Vega› (1909).

**RENNES,** rĕn, France, capital of the department of Ille-et-Vilaine (formerly capital of Brittany), situated at the junction of the rivers Ille and Vilaine. It is divided by the Vilaine, traversing the city from east to west, into the High and Low Town. The High Town is elegantly built on the right bank of the river; the Low Town is unprepossessing and older (11th–13th century) and suffers from frequent inundations. The buildings of interest are: The cathedral, of pseudo-Ionic style; the archiepiscopal palace; the old parliament house, and the statutes of many celebrities; the town-house, containing a fine picture gallery, with work by Veronese, Michelangelo, Tintoretto, Van Dyck, Rembrandt and Rubens; splendid scientific and other collections; important archives and a large library. Rennes has courts of justice of first and second instance. The industries embrace tanneries, wax-bleaching, printing, stained paper, hats, boots and shoes, gloves and agricultural implements. There is an extensive trade in butter, honey, wax, cotton and linen yarns, lace, earthenware, etc. Rennes is very ancient, dating from Condate, the capital of the Gallic Redones. It was the scene of the second court-martial of Captain Dreyfus for high treason (September 1899). Pop. 80,000.

**RENNET,** the prepared inner surface of the stomach of a young calf. It contains much pepsin and has the property of coagulating the casein of milk and forming curd. It is prepared by scraping off the outer skin and superfluous fat of the stomach when fresh, keeping it in salt for some hours and then drying out. When used a small piece of the membrane is cut off and soaked in water, which is poured into the milk intended to be curdled.

**RENNIE,** rĕn'ĭ, **George,** English civil engineer, son of John Rennie (q.v.): b. London, 3 Sept. 1791; d. there, 30 March 1866. He was educated at the University of Edinburgh and in 1811 entered the office of his father. He was inspector of machinery of the mint in 1818–26, and in 1821 engaged with his brother Sir John Rennie (q.v.) in completing several important works begun by their father, among which were the breakwater at Plymouth, various docks, harbors, canals and the London Bridge. He laid out the Liverpool and Manchester Railway in 1826, was chief engineer of the Namur and Liège Railway in 1846, constructed the first screw-propelled ship in the British navy, the *Mermaid,* in 1840, and was engaged in the construction of naval works at Sebastopol and other foreign ports besides those in English harbors. After the retirement of his brother, Sir John, in 1845, he conducted the business of the firm in partnership with his two sons.

**RENNIE, John,** Scottish civil engineer: b. Phantassie, Haddingtonshire, 7 June 1761; d. London, 4 Oct. 1821. At an early age he showed an interest in mechanics and frequented the shop of the millwright Andrew Mickle, inventor of the threshing machine. Later he spent three years at the Edinburgh University, and in 1784, having already established a business of his own, he visited James Watt at Soho, Staffordshire, and by Boulton and Watt was engaged to take charge of the work of the Albion Flour Mills, Blackfriars, London. Rennie designed all the machinery, using iron instead of wood for the shafting and framing. In London his reputation rapidly increased until he was ranked foremost among the civil engineers of Great Britain. Among his public works may be mentioned Ramsgate Harbor; Waterloo and Southwark Bridges, across the Thames, and the design of London Bridge, the structure being completed after his death; the breakwater at Plymouth, and several similar structures, where submarine masonry was carried to great perfection. He superintended likewise the execution of the Grand Western Canal, from the mouth of the Exe to Taunton; the Polbrook Canal, Cornwall; the Aberdeen Canal, uniting the Don and the Dee; that between Arundel and Portsmouth, and, his chief work in connection with inland navigation, the Kennet and Avon Canal, between Bath and Newbury, the London Docks, the East and West India Docks, the Prince's Dock at Liverpool, and those of Dublin, Greenock and Leith were also designed by him. In prosecuting his works he made use of the diving-bell which he greatly improved and the steam-dredging machine, apparently without the knowledge that in its invention he had been anticipated by Sir Samuel Bentham.

**RENNIE, Sir John,** English civil engineer, younger son of John Rennie (q.v.): b. London, 30 Aug. 1794; d. Bengeo, near Hertford, Hertfordshire, 3 Sept. 1874. At 16 he like his brother began the study of engineering under his father. When his father died in 1821 he continued with his brother George to carry on the extensive business left in their hands. He made hydraulic engineering a special study and through his efforts large tracts of land on the eastern coast of England, including part of the Lincolnshire fens, were reclaimed and made extremely productive. The finest works of the Rennies are their bridges, which may be seen in all parts of England and Scotland, London Bridge being the most massive of them all. On the occasion of the opening of this bridge in 1831 John Rennie was knighted, an honor his brother declined. After the dissolution of the partnership in 1845, Sir John practised as an architect. He introduced the system of railways in Sweden, made important surveys of the harbor of Oporto in Portugal and designed, and in great part executed, the harbor of Ponte Delgada in the Azores, one of his latest public works. In 1845 he was elected president of the Institute of Civil Engineers. He was the author of ‘Theory, Formation and Construction of British and Foreign Harbors’ (1851–54), Consult his ‘Autobiography’ (1875).

**RENNO RENAPPI,** the native name for Delaware Indians (q.v.).

**RENO,** rē'nō, **Conrad,** American lawyer, son of J. L. Reno (q.v.): b. Alabama, 28 Dec. 1859. He was graduated from the Boston University Law School in 1883 and afterward practised in Boston. He published ‘State Regulation of Wages’ (1891); ‘Non-Residents and Foreign Corporations’ (1892); ‘Employers' Liability Acts’ (1896–1903); ‘History of the Judicial System of New England’ (1900); ‘The Spirit of Progress,’ a dramatic fable (1908–14).

**RENO, Jesse Lee,** American military officer: b. Wheeling, W. Va., 20 June 1823; d. South Mountain, Md., 14 Sept. 1862. He was graduated from West Point in 1846, served with distinction in the Mexican War, was assistant professor of mathematics at West Point in 1849 and at the outbreak of the Civil War was commissioned brigadier-general of volunteers. He rendered gallant service at Roanoke Island, Newbern and Camden, and was promoted major-general in 1862. He took part in the battles at Manassas and Chantilly and after repulsing the Confederates under General Lee at South Mountain was killed while leading a charge.

**RENO, Jesse Wilford,** American engineer, son of J. L. Reno (q.v.). b. Fort Leavenworth, Kan., 4 July 1861. He was graduated from Lehigh University in 1883, afterward pursuing a special course in mining and engineering. In 1885–90 he was engaged in mining in Colorado and later became an electric railway expert. In 1892 he invented the inclined elevator or moving stairway (see Escalator), for which he was awarded the medal of the Franklin Institute in 1914 and later became consulting engineer of the Otis Elevator Company. He was a frequent contributor to technical publications.

**RENO, Marcus Albert,** American military officer: b. Illinois, about 1835; d. Washington, D. C., 31 March 1889. He was graduated from West Point in 1857 and at the outbreak of the Civil War was made first lieutenant in the United States army. He was promoted captain in the same year, brevetted major for gallantry at Kelly's Ford, Va., in 1863, lieutenant-colonel for services at Cedar Creek and in 1865 was brevetted brigadier-general of volunteers and colonel of regulars for distinguished service throughout the war. In 1876 he was engaged in the campaign against the Indians under Sitting Bull, holding command second to General Custer. In the engagement in which Custer and nearly all his regiment were killed, Reno escaped through cowardice and in consequence of his failure to support his associates and other serious charges he was dismissed from the service.

**RENO,** Nev., city, county-seat of Washoe County, on the Truckee River and on the Western Pacific, the Southern Pacific and the Virginia and Tennessee railroads; in the extreme western part of the State, about 30 miles north of Carson City. It was settled in 1858 by eastern emigrants who had started for California. It was incorporated in 1869 and in 1901 was chartered as a city. It is in a farming and stock-raising region and is the most important and largest city in the State. The chief industrial establishments are railroad machine shops, which have 2,500 employees; abattoir and packing houses, electric-power plant, pressed brick works, two flour mills, a cracker factory and a number of smaller factories. The trade is chiefly in farm products, livestock and manufactures. It is an important distributing point for a vast territory. The principal public buildings are a government building, eight churches and the Nevada State Hospital for Mental Diseases. The educational institutions are the State University, opened in 1886, State Agricultural College and Experiment Station, a normal school, Academy of Our Lady, public and parish schools and a Carnegie library. The five banks have a combined capital of $2,500,000 and the annual amount of business is $64,000,000. The government is vested in a mayor and a city council of five members, all of whom are elected by the people. Pop. (1920) 12,016.

**RENOIR,** rė-nwär, **Auguste,** French painter: b. Limoges, 1841. He exhibited at the first Impressionist Salon in 1874 after studying under the impressionist Monet and others of the same school. While he paints figures principally and possesses singular skill in depicting flesh color and skin texture, as well as facial expression, he has remarkable success in landscape, in fruit and in flowers, which he sets on the canvas with astonishing boldness and vividness of presentation. He is certainly one of the most original and independent of the school to which he belongs. His ‹Jeunes Filles au Piano› is a good example of his qualities; among others ‹Une Danseuse,› ‹La Rose,› ‹Une tasse de thé,› and ‹La Seine à Argentenie.› Among his portraits are those of Claude Monet, his master, and the composer Wagner. Consult Duret, ‹Les Peintres-Impressionistes› (1879); also ‹Exposees en partie à l'Exposition centennale de l'art francais› (1900).

**RENOUF,** rė-noof, **Emile,** French painter: b. Paris, 23 June 1845; d. Havre, 6 May 1894. He chose for his subjects the scenery of the sea and incidents in the lives of those who live on the seashore, fishermen, etc., but he also did some good work in landscape and genre. His fine marine ‹After the Storm› is in the New York Metropolitan Museum and his ‹Helping Hand› (a child holding to an oar, while a sturdy fisherman rows), is in the Corcoran Gallery, Washington. While in New York (1887–88) he painted ‹Brooklyn Bridge,› which at present is in the public gallery at Havre. In 1883 he was awarded a first class medal at Munich and in 1889 the Legion of Honor.

**RENOUF,** Sir **Peter Le Page,** English Egyptologist: b. Guernsey, 23 Aug. 1822; d. London, 14 Oct. 1897. He was educated at Elizabeth College, whence he passed to Pembroke College, Oxford, where he came under the influence of Newman and the Tractarians and in 1842 entered the Roman Catholic Church. From 1855 to 1864 he was professor in the Catholic University of Ireland, first of French literature and the history of philosophy and subsequently of ancient history and Oriental languages. He began his career as an Egyptologist about 1860 and in 1863 defended the work of Young and Champollion against Sir George C. Lewis. He opposed the dogma of papal infallibility and in connection with this subject wrote on ‹The Condemnation of Pope Honorius› (1868) and ‹The Case of Pope Honorius Reconsidered› (1869). From 1866 until 1885 he was an inspector of schools and during 1885–91 he was keeper of the Egyptian and Assyrian antiquities in the British Museum. In 1875 he published ‹An Elementary Grammar of the Ancient Egyptian Language› (2d ed., 1896), and in 1879 delivered a course of Hibbert lectures on the ‹Origin and Growth of Religion as Illustrated by the Religion of Ancient Egypt› (1880; 2d ed., 1884). He was knighted in 1896. He left unfinished a translation of the ‹Book of the Dead,› with commentary, which at the time of his death was in course of publication (1892 et seq.) in the ‹Proceedings› of the Society of Biblical Archæology, of which he was president from 1887. The work was completed from Renouf's notes by E. Naville. Renouf was one of the most careful and trustworthy Egyptologists of his time and was in addition a most versatile linguist. For a sketch of him, with a bibliography of his writings, consult the ‹Proceedings› of the Society of Biblical Archæology (Vol. XIX, 1897).

**RENOUVIER, Charles Bernard,** French philosopher: b. Montpellier, 1 Jan. 1818; d., 1 Sept. 1903. After studying at the École Polytechnique at Paris, he began to take an interest in politics. He lived a life of retirement devoted to study and writing. His principal works are ‹Essais de critique générale› (1854–64); ‹Science de la morale› (1869); ‹Uchronie› (1876); ‹Esquisse d'une classification systématique des doctrines philosophiques› (1885–86); ‹Philosophie analytique de l'histoire› (1896–97); ‹Histoire et solution des problèmes métaphysiques› (1901); ‹Victor Hugo: le Poète› (1893); ‹Le Philosophe› (1900); ‹Les Dilemmes de la métaphysique pure› (1901); ‹Le Personnalisme› (1903); ‹Critique de la doctrine de Kant› (1906). His philosophy is idealistic and is based on Kant. However, he differs from Kant in several respects. He trusts only in personal experience as shown by phenomena as the true test of validity and distrusts every doctrine of an unknowable as a basis of explanation of the universe, whether that unknowable be spiritual, ideal or material force. Realities are of objective as well as subjective aspect. In his theory of volition, he holds that liberty is the real and fundamental characteristic of man; and that belief consists also in an act of will. In the field of religion, he is opposed to any doctrine of an infinite God, but believes that the consent of the doctrine of a finite God and immortality is rational and justifiable. Consult Prat, L., ‹Les Derniers entretiens de Charles Renouvier› (1904); Darlu, A., ‹La Morale de Renouvier› (1904); Séailles, G., ‹La Philosophie de Charles Renouvier› (1907).

**RENOVO,** rē-nō'vō, Pa., borough in Clinton County, on a division of the Pennsylvania railroad, about 125 miles northeast of Pittsburgh and 25 miles northwest of Lock Haven. It is in a region of the Alleghany Mountains noted for grand scenery and an abundance of game. Renovo is a summer resort which is growing in favor. It has considerable industrial interests connected with the extensive bituminous coal-fields and the fire-clay deposits in the vicinity. The chief industrial establishments are the Pennsylvania railroad shops, the coal yards and the brick works. There is a national bank, with (1917) capital $50,000 and resources $986,970. Pop. (1920) 5,877.

**RENSSELAER,** rĕn′sę-lėr, Ind., city, county-seat of Jasper County, on the Iroquois River and on the Chicago, Indianapolis and Louisville Railroad, about 100 miles northwest of Indianapolis. It was settled in 1834 by David Nowles, John Nowles and Joseph Yeoma. It was incorporated in 1850 and chartered as a city on 1 May 1896. Rensselaer is in an agricultural region; and its industries are chiefly connected with farm products and livestock, of which it makes considerable shipments. There are five churches, Saint Joseph's College, a high school, public elementary schools, Monnet School for Girls, a Catholic seminary, public library, business schools and a national bank, with (1917) capital $60,000 and resources $574,602. The government is vested in a mayor and a council of six members elected biennially. Pop. 2,393.

**RENSSELAER,** N. Y., city in Rensselaer County, on the Hudson River and the Boston and Albany, the New York Central and Hudson River railroads, opposite Albany and six miles south of Troy. It is connected with Albany, Troy and other cities by electric lines and by steamboat with many cities and towns on the river. Three large bridges span the Hudson and connect Rensselaer with Albany. The first settlement was made by the Dutch. It was incorporated as a village in 1815 and in 1897 was chartered as a city. It was called Greenbush until it became a city, when it took the name Rensselaer. The village of Bath was annexed in 1902. Rensselaer is a commercial and manufacturing city, noted for its chemical and aniline works, felt factory, tannery and shirtwaist factory. According to the United States census for 1914, the city had 32 manufacturing establishments, employing a capital of $2,317,925 and yielding products valued at $2,755,418. A large number of persons are employed in connection with the railroads and steamboats and in the offices, stores and factories in Albany and Troy. There are 10 churches, two public schools, one parish school, Saint John's Academy, Saint John's Orphan Asylum, Franciscan Father's Home, Genet Barracks and Memorial Park. Fort Cralo, built in 1642, still stands. The government is vested in a mayor and a common council of 10 members, elected biennially. Pop. (1920) 10,823.

**RENSSELAER POLYTECHNIC INSTITUTE,** located at Troy, N. Y. It was founded by Stephen Van Rensselaer in 1824 as a school of practical science, being the first school of science and the first school of engineering to be established in any English-speaking country. It was first opened to students in January 1825 and incorporated in March 1826. It was at first named the Rensselaer School, afterward the Rensselaer Institute and finally the Rensselaer Polytechnic Institute. Lectures on land surveying and engineering were given as early as 1823; and after 1850 the Institute became more distinctly a school of civil engineering; the course at that time was lengthened from one year to three years. It now offers two courses of four years each, one in natural science and one in civil engineering. These courses include instruction in chemical analysis, mineralogy, metallurgy and assaying, as well as in the design and construction of roads, railroads, bridges, roofs, arches, dams, steam engines, electric engines, dynamos, turbines, foundations, waterworks, tunnels, sewers and canals. The degrees of B.S. and C.E. are conferred. The students in 1923 numbered 1,100 and the faculty 90. Its influence has been widespread. Students have come to it from 42 of the States of the Union and 25 foreign countries, and its graduates are at present practising their profession in 45 of the States and 19 foreign countries. Its standing as a professional school is shown by the following extract from the report to the German government by Prof. A. Riedler of the Royal Polytechnicum of Berlin: "The greatest number of renowned hydraulic and railroad engineers of America are graduates of this school."

**RENT.** Rent is commonly defined as the income received for the use of land, whether the owner uses it himself or leases it to some one else. Land, however, must be distinguished from real estate which includes not simply the land itself, but the permanent improvements and the fixtures on the land. Land in the strictly economic sense means simply the original and indestructible properties of the soil. Economic rent would, therefore, include only the income received for the use of these original and indestructible properties. There is still some question as to whether land should be so defined as to include the available supplies of plant food which may be found in the soil. From the standpoint of the original settler on a piece of virgin land, considerable supplies of plant food are found in the soil and may, therefore, be regarded as original properties. In older and more permanent settlements, however, this original supply of plant food has long been exhausted and whatever plant food there is in the soil must be regarded as one of the improvements which have been placed on the land, along with draining, fencing, wells, buildings and so forth. In short, while a certain amount of plant food may have been one of the original properties of the soil, it is clearly not an indestructible property. It may easily be exhausted and usually has to be replaced by human endeavor. There is, therefore, a tendency to define land in stricter terms so as to include only the physical and geometrical properties of solidity, extension and location. Rent in this strict and narrow interpretation is that which the owner receives for the use of these physical and geometrical properties. This definition is satisfactory for urban land. The only difficulty is in applying it to farm land. The physical and geometrical properties of solidity, extension and location are the only properties that give urban land any appreciable part of its value. These are the only properties needed for building purposes. Farm land, however, derives a large part of its value from soil fertility which is partly chemical. The farm owner who receives rent from his farm is not likely to distinguish that part of his income which is due to the chemical fertility of his soil from that part which is due to the physical and geometrical properties of solidity, extension and location.

The principle which determines the amount which a piece of land yields in the way of rent has been variously stated. The most widely accepted statement is that formulated first by the Scotch writer, Anderson, and later by the Englishman, Ricardo. Both regard rent as due to a preferential value. If we assume that there is always free land, that is, land which can be had free of charge, then the utmost which will be paid for the use of a particular piece of land is the equivalent of the superiority of this land over such free land as may be had. Something can always be produced on free land. If we can determine how much more can be produced with the same amount of labor and expenditure on a given piece of land than could be produced on free land, the difference between these two products will measure the degree of preference for the piece of land in question; or this difference in product will represent the preferential value of the better piece of land. Stated in formal terms, this law of rent is as follows: The rent of a given piece of land is equal to the difference between what it will yield under the method of treatment suited to its condition and that which the best free land available could be made to yield with the same application of labor and capital under a treatment suitable to its condition.

The cause of rent is undoubtedly the scarcity of land. This does not mean that all land of all qualities is scarce, but that lands of certain desirable kinds and qualities are scarce. These are the only lands that yield rent. If we consider a certain desirable piece of land and find that there is not enough of the same grade to supply all the needs of the community, then, in order that the needs of the community may be supplied, inferior grades of land must be brought into use. Rather than make use of these inferior grades, cultivators, builders and so forth will pay something for the use of the better grades. While the cause of rent is the scarcity of the better grades of land, the amount of rent is limited by the presence and availability of inferior grades of land and their degree of inferiority. If there is an abundance of land only slightly inferior to the piece of land in question, this piece of land will command a low rental. If there is a scarcity of inferior land and if it is vastly inferior to the piece of land in question, then the piece of land in question will command a high rental. There is another way of looking at the question of rent, though it leads to much the same conclusion. The rent of a given piece of land may be said to be equal to its social productivity. If a given piece of land is brought into cultivation, the labor and capital necessary to its cultivation cannot be used on other land, or if it is thrown out of cultivation, the labor and capital which formerly cultivated it must be now employed on other land. How much difference does it make to the community whether this piece of land is cultivated or not? If it is a good piece of land and is thrown out of cultivation, the labor and capital which formerly cultivated it will produce less when employed on other land than it formerly produced on the piece of land in question. When we determine how much less, we have a measure of the social value or the social productivity of the piece of land in question. If it is very poor land, and there is plenty of other land equally good on which the labor and capital can be employed, it will make no difference whatever to the total productivity of the community whether the piece of land in question is cultivated or not. In that case the piece of land in question is worth nothing and will command no rent. The more difference it makes to the community whether the piece of land in question is used or not, the higher the rental which it will command.

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**RENT, Law of.** Rent being the sum, duty or return levied on the occupants, lessee or user of land, buildings, apartments, rooms, machinery, tools, power, heat, artificial light, etc., for the benefit of the owner it follows that a relation is thereby instituted from which many legal complications may arise. The relation established that of landlord and tenant. A subtenant is one who rents all or part of the premises from the original tenant. A lease is a legal instrument by which the relation of landlord and tenant is formally established and which to a very great extent defines the privileges, duties and obligations of the parties subscribing to it. The relation is often less formally established and may arise by implication if the acts of the parties are consistent with it. A tenant is bound to pay the stipulated rent at the time stated in his lease or contract or otherwise agreed upon. Should he fail to do so, however, his status of tenant is not affected, but the landlord acquires a right to institute a civil action to recover the amount in default and further may levy a distress. A tenant who occupies the premises beyond the term of his lease or contract becomes liable for the rent of the next ensuing period, week, month, etc., as the case may be. He becomes in such a case a tenant at will and his tenancy may be terminated at the will of the landlord. Statutes in some jurisdictions hold that a tenancy not governed by a lease is a tenancy at will. Such a tenancy may be terminated in various ways, i.e., by the lease of the property to a third person, by the death of either the landlord or tenant, by the sale of the property, or by any act on the part of the landlord amounting to a demand for possession or showing such intention. A lease once signed, the lessee or tenant is ordinarily liable for the rent agreed upon whether or not he takes possession, except in the case where the premises are destroyed before the beginning of the term. A lease is terminated by the sale of the property under foreclosure proceedings. Unless contained in the agreement a landlord is not compelled to make repairs, nor is he liable for them, and seldom for any injury caused by the condition of the premises. A landlord is generally liable to tenants for injuries due to accidental defects, and for any negligence on his part. In modern states increasing liabilities are being placed upon property-owners, property being held in less divine regard than formerly and persons proportionally higher. Thus in modern cities, the landlord is often obliged to keep passageways and approaches lighted, to prevent any obstruction of a passageway, which would render it dangerous. The duty of removing ice and snow in many cases devolves upon the tenant. Where heat, light, power, etc., are included in the agreement, failure of the landlord to supply same creates a right of the tenant to damages. The owner is obliged to maintain the premises in a habitable condition. Disputes and suits at law over repairs have been so numerous as to cause very many landlords to insert in their leases a clause that all repairs shall be made by the tenant. Of course this involves a reduced rental. An action at law at any time can be maintained by the landlord, or his assignee, to recover rent, and under ordinary circumstances no prior demand is necessary; in few jurisdictions, however, is the landlord authorized to attach the property of a tenant, but never the household goods, trade tools, etc. Courts have held that the right to collect rent was a species of real property that might be delegated, held in fee, or willed to posterity. Every State has its own laws and many municipalities have ordinances that tend to complicate greatly the relations of landlords and tenants. It is impossible, therefore, within the limits of the present article to give details of the statutes obtaining in the several jurisdictions. See FEE; LANDLORD AND TENANT; LEASE; PROPERTY, LAWS OF. Consult Kent, J., ‹Commentary on American Law› (14th ed., 4 vols., Boston 1896); Maine, H. J. S., ‹Lectures in the Early History of Institutions› (7th ed., London 1897); ‹Corpus Juris› (New York 1915 et seq.); Tiffany, H. T., ‹The Law of Landlord and Tenant› (New York 1913); Williams, T. C., ‹Principles of the Law of Real Property› (19th ed., London 1901).

**RENTON,** Wash., city in King County, 10 miles southeast of Seattle, on the Columbia and Puget Sound, the Northern Pacific and the Chicago, Milwaukee and Saint Paul railroads. There are clay, coal and lumber interests and manufactories of bricks, briquettes and cars. Pop. (1920) 3,301.

**RENUNCIATION,** *in law,* the act of giving up a right, such as the position of an executor or administrator of an estate, or any other office, charge or claim to which the person renouncing is legally entitled. The term is applied especially to the act of an executor, who, having been nominated in a will, and having the option of acting as such or not, declines to act, and in order to avoid any liability expressly renounces the office. There are proper legal forms for such action.

**RENWICK, Edward Sabine,** American engineer and patent expert: b. New York, 3 Jan. 1823; d. 19 March 1912. He was graduated from Columbia in 1839 as a civil and mechanical engineer and became superintendent of large iron works at Wilkesbarre, Pa. In 1849 he began his career as a patent expert and in 1862, with his brother Henry Renwick, he repaired a break 82 feet long and 10 feet wide in the bilge of the Great Eastern while afloat, a feat deemed an impossibility by experts. He invented several machines and mechanical appliances and published ‹Practical Invention› (1893).

**RENWICK, James,** Scottish covenanter: b. Moniaive, Dumfriesshire, Scotland, 15 Feb. 1662; d. Edinburgh, 17 Feb. 1688. He was educated for the ministry at the University of Edinburgh, but upon declining to recognize Charles II as the head of the Church was refused a degree. He finished his education at Groningen, Holland, was ordained in 1683, returned to Scotland and engaged in preaching at conventicles. He was outlawed in 1684 as a result of publishing with Alexander Shields ‹An Informatory Vindication of the Covenanters.› When James II came to the throne (1685), Renwick with 200 men went to Sanquahar, and published a declaration rejecting him, and in 1687, as the acknowledged leader of the Cameronians a price was put upon his head, and he was hunted from place to place. He was captured in the following year and executed at Edinburgh.

**RENWICK, James,** American scientist: b. Liverpool, England, 30 May 1790; d. New York, 12 Jan. 1863. He came with his parents to New York in 1794, was graduated from Columbia and in 1812 acted as instructor in natural philosophy there. In 1814 he became a topographical engineer with rank as major in the United States service and in 1820–53 was professor of chemistry and physics at Columbia. In 1840 he was engaged as one of the commissioners to survey the boundary line between United States and New Brunswick. His publications include ‹Outlines of Natural Philosophy› (1822–23); ‹Treatise on the Steam Engine› (1830); ‹Elements of Mechanics› (1832); ‹Outlines of Geology› (1838); ‹Applications of the Science of Mechanics to Practical Purposes› (1840); ‹Memoir of De Witt Clinton› (1840); ‹Life of John Jay› and ‹First Principles of Chemistry› (1841); ‹First Principles of Natural Philosophy› (1842); lives of ‹David Rittenhouse› (1839); ‹Robert Fulton› (1845), and ‹Count Rumford› (1848), in Sparks's ‹Library of American Biography›; lectures on ‹Chemistry Applied to the Arts,› etc.

**RENWICK, James,** American architect: b. New York, 3 Nov. 1818; d. there, 23 June 1895. He was son of the preceding, and was graduated at Columbia College in 1836. Among his many works are Grace Church, New York, completed in 1845; the Smithsonian Institution and the Corcoran Art Gallery, Washington, D. C.; Vassar College, Poughkeepsie; and Saint Patrick's Cathedral, New York. This list of buildings shows the versatility of this truly learned architect, whose mastery of French-Gothic, both in its details and proportions, enabled him to give New York two of the noblest ecclesiastical exteriors in the city. He gathered a remarkable collection of professional material which he bequeathed to the Metropolitan Museum of Art, New York.

**REORGANIZED CHURCH OF JESUS CHRIST OF LATTER DAY SAINTS, The,** organized 6 April 1860, at Amboy, Ill. On 27 June 1844 Joseph Smith, President of the Church of Jesus Christ of Latter Day Saints and his brother Hyrum, the Patriarch, were murdered by a mob at Carthage, Ill. Following this event several aspirants arose claiming the right to the presidency of the Church. The most prominent of these were Sidney Rigdon, William B. Smith and James J. Strang. Sidney Rigdon, who served as first counselor to the Prophet Joseph Smith 1833–44, was the first to make the claim, stating that the Church should choose him as «Guardian» to stand for the martyred president. By appointment, a conference of the Church was held 8 Aug. 1844, in Nauvoo, Ill., at which Mr. Rigdon presented his claims at length and was rejected by the assembled members when the question was put to vote. At this same conference the Twelve Apostles were sustained by unanimous vote as the presiding quorum of the Church agreeable to the revelation which reads: «The Twelve traveling counselors are called to be the Twelve Apostles, or special witnesses of the name of Christ in all the world; thus differing from other officers in the Church in the duties of their calling. And they form a quorum equal in authority and power to the three Presidents previously mentioned.» (Doctrine and Covenants 107; 23–24). After the rejection of his claims, Sidney Rigdon became disaffected and withdrew to Pittsburgh, Pa., with a small following, over which he presided for a few years, when the organization, for lack of members, ceased to exist. William B. Smith claimed the right to the presidency by virtue of being the only surviving brother of Joseph Smith. His following was always small and soon disbanded. James J. Strang declared that he had been appointed by the Prophet Joseph Smith to be his successor, in a letter written but a few days before the tragedy. He was a man of some ability and gathered about him a few prominent men who refused to remain with the Church under the leadership of Brigham Young and the Twelve Apostles. For a time his organization appeared to flourish, but like the organizations of Sidney Rigdon and William B. Smith, soon fell into decay and was deserted by many members. In the year 1852 Jason W. Briggs, a resident of Beloit, Ill., and Zenas H. Gurley, gathered some of the scattered remnants from these organizations and formed branches at Beloit, Waukesha and Yellowstone, in what they called the «New Organization of the Church.» Jason W. Briggs, it is said, held the office of Elder in the Church of Jesus Christ of Latter Day Saints previous to the death of Joseph Smith. Until 1846, the year of the exodus to the west, he remained a member of the Church. Later he joined the organization of James J. Strang, then that of William B. Smith in which he remained until 1851. Zenas H. Gurley, before the death of the Prophet Joseph Smith, held the office of Seventy. He also accepted the leadership of Brigham Young and the Twelve Apostles until the exodus in 1846, when he withdrew and became a member of the Church under James J. Strang. In this organization he labored diligently until 1851. After Jason W. Briggs and Zenas H. Gurley joined their forces in 1852, they commenced to preach the doctrine of the «rejection» of the Church of Jesus Christ of Latter Day Saints or the «original church» because they said the saints had failed to build the temple at Nauvoo within a given time, which expired at, or shortly following, the death of Joseph and Hyrum Smith. Because of this «rejection» they said it became necessary for the church to be newly organized that it might find favor with the Lord. They also promulgated the doctrine of «lineal priesthood» claiming that it was the right of the oldest son of Joseph Smith to succeed his father in the presidency of the Church. For a number of years they labored to induce Joseph Smith, son of the Prophet Joseph, to take the presidency of the new organization, but without success. Finally, at a conference held at Amboy, Ill., 6 April 1860, he consented and was installed as president of the new organization, which was later incorporated as the Reorganized Church of Jesus Christ of Latter Day Saints.

*The Saints' Herald*, the official publication of the Church, was begun 1 Jan. 1860, at Cincinnati, Ohio. It was removed to Plano, Ill., March 1863. Since 1881 it has been published at Lamoni, Iowa. Joseph Smith was its editor-in-chief from 1865 to 1914. The Church held annual and semi-annual conferences until and including 1882, when the semi-annual were discontinued. The headquarters were at Plano, Ill., from 1863 to 1881; since then at Lamoni, Iowa. The quorums of the reorganization are organized in the same order which existed at the death of Joseph Smith. The doctrines are as follows:

A belief in God the Eternal Father, his Son Jesus Christ, and the Holy Ghost.

That men will be punished for their own sins, and not for Adam's transgression.

That all men may be saved by obedience to the laws and ordinances of the gospel, namely, faith in God and the Lord Jesus Christ; repentance; baptism by immersion for the remission of sins; laying on of hands for the gift of the Holy Ghost; the resurrection of the body; that the dead in Christ will rise first; that men shall be judged, rewarded, or punished, according to the degree of good or evil they shall have done.

That a man must be called of God, and ordained by the laying on of hands of those who are in authority, to entitle him to preach the Gospel, and administer in the ordinances thereof.

In the same kind of organization that existed in the primitive Church.

That in the Bible is contained the word of God, so far as it is translated correctly. That the canon of Scripture is not full, but that God, by His Spirit, will continue to reveal His word.

In the powers and gifts of the everlasting gospel, namely, the gift of faith, discerning of spirits, prophecy, revelation, healing, visions, tongues, and the interpretation of tongues, wisdom, charity, brotherly love, etc.

That marriage is ordained of God; and that the law of God provides for but one companion in wedlock, for either man or woman, except where the contract is broken by death or transgression.

That the doctrines of a plurality and a community of wives are heresies. The Book of Mormon says: "Wherefore, my brethren, hear me, and hearken to the word of the Lord: For there shall not any man among you have save it be one wife, and concubines he shall have none.

That the religion of Jesus Christ, will, if its precepts are accepted and obeyed, make men and women better in the domestic circle, and better citizens, and consequently better fitted for the change that cometh at death.

That men should worship God in "Spirit and in truth;" and that such worship does not require a violation of the constitutional law of the land.

The Church has been more aggressive in its fight against polygamy than any other organization. The local work is divided into the following organizations according to latest reports: Two States, Lamoni, Iowa; and Independence, Mo.; both organized in 1901; 74 districts; 62 in the United States, two in Australia, five in England, two in Wales, two in Canada and one in Nova Scotia. The reorganization supports Graceland College and a home for the aged, both at Lamoni, Iowa. It is prosecuting missionary work throughout the United States, the Canadas, Australia, New Zealand, Society Islands, Sandwich Islands, the British Isles, Scandinavia and other countries. The membership is about 75,000.

**REPAIRS.** See LAW OF LANDLORD AND TENANT.

**REPARATIVE SURGERY.** See SURGERY.

**REPEAL,** the rescission, annulling, or revocation of a law. Repeal of a statute may be express or implied. It is express when the repealing statute states specifically that a prior statute has been abrogated. It is implied when the statute does not refer specifically to a prior statute but contains provisions wholly or in part repugnant thereto. In case only a part is repugnant, the other part of the prior statute continues in effect.

**REPEAL MOVEMENT,** the agitation for the repeal of the Union between Great Britain and Ireland. This agitation began almost at the moment of the Union, and has continued to the present time. Robert Emmet sacrificed his life to the cause of repeal in 1803. But the word repeal is most intimately connected with the name and career of Daniel O'Connell, the Irish «Liberator.» O'Connell died in 1847, and the cause of repeal was taken up by the Young Ireland party of 1848; by the Fenians, whose operations came to a head in 1865–67; and finally by the Home Rule party organized under the leadership first of Isaac Butt, in 1870, and later under the leadership of Charles S. Parnell. During the celebrated Parnell Commission of 1888–89, however, the Home Rule party, through their counsel, disclaimed all desire for repeal, maintaining that their aims were confined to the obtaining of Home Rule in the strict, or restricted, sense of the word.

**REPEATER,** *in arithmetic,* an indeterminate decimal in which the same figures continually recur or are repeated. A pure repeater, or circulating decimal, is one in which the repetition goes on from the beginning; as, .3333 . . . .272727 . . . A mixed repeater is one in which the repetition does not begin till after the intervention of a figure or figures; as, .128888 . . . , .0113636 . . ., etc. For the algebraic method of finding the value of a repeating decimal see Progression.

*In firearms,* an arm which may be caused to fire several successive shots without reloading, whether rifle, pistol or cannon. *In horology,* a watch or clock made to strike the time when a spring is pushed in. Some strike the hour and quarter, others the hour, quarter and odd minutes. *Nautically,* a vessel, usually a frigate, appointed to attend each admiral in a fleet, and to repeat every signal he makes, with which she immediately sails to the ship for which it is intended, or the whole length of the fleet when the signal is general; called also a repeating ship. *In telegraphy,* the same as relay.

**REPEATING.** See Ballot.

**REPENTANCE,** or **CONTRITION,** as understood by divines, both Protestant and Catholic, is defined by the Council of Trent as «grief of mind and detestation of sin committed, with a purpose of sinning no more»; more specifically it is that sorrow for sin which arises out of consideration of God's goodness which sin has outraged, and which includes a resolution never more to offend God because God so deserves our love. This is the repentance called by Protestant divines «goodly sorrow.» The same Protestant divines recognized a second kind of repentance, which mourns that sin is attended by a penalty rather than hates sin. This differs little from the «attrition» of Catholic divines, which is an imperfect sorrow for sin arising from such motives as fear of hell, loss of heaven, the turpitude of sin. Consult Psalms li, 4; Acts v, 31, xl, 18; 2 Timothy ii, 25; Matthew xxvii, 3–5.

**REPLACEMENT.** See Metasomatism.

**REPLEVIN,** rē-plĕv'ĭn (French *replevin,* from Middle Latin *replivire,* to pledge), an action for the recovery of unlawfully possessed or detained goods or chattels. The action requires the issue of a writ for the seizure of the goods. To effect this the plaintiff must file a bond large enough to cover all probable resulting damage of the action to the defendant; or the latter may, in some cases, give bond and retain the possession of the contested goods until the case is settled. Should the plaintiff win the action he is entitled to the return of the goods, or, in case this be impossible, the payment of their value. In either case he is also entitled to damages for the retention of the goods. But should the plaintiff lose the action the defendant may recover damages and may sue for the same on the plaintiff's bond.

**REPLICATION,** from the Latin *replicatio,* an answer, a reply. *In law,* the reply of the plaintiff to the defendant's plea.

**REPLY TO HAYNE, The.** The reply delivered by Daniel Webster of Massachusetts in the United States Senate 26–27 Jan. 1830 (to Senator Robert Y. Hayne, of South Carolina) was the culmination of a debate that arose over an unimportant resolution regarding the sale of the public lands, and grew to include sectional political issues. The oration may be divided into two sections. The first replies in detail to charges of political inconsistency which had been brought against New England and against Webster personally, and closes with a glowing eulogy on Massachusetts. The second and more important section opposes the claim of South Carolina to the right of nullification, and leads up to the famous peroration on the Union, closing «Union and Liberty, now and forever, one and inseparable.» This last passage was for many years the best-known piece of American political oratory with the exception of Patrick Henry's «Give me liberty, or give me death.» The two impassioned outbursts, closing the two sections of the address, are, however, each but a paragraph in length. The greater part of the Reply, which occupied four hours in the delivery, is taken up with simple and direct reasoning, and while it gives the sense of great moral earnestness on the part of the speaker it contains no obvious appeal to the feelings of the hearers. Webster, who according to tradition once said that his whole life had been a preparation for the ‹Reply to Hayne,› spoke almost extemporaneously, and the chief impression which his address produces is that of vast grasp of all the widely different matters on which he touches. There were two sides to the questions under discussion, as there always are, but to many of his hearers he seemed to have annihilated the arguments of his opponent. In a private letter Webster once referred somewhat oddly to the Reply as «No. 1 among my political efforts,» and to the Seventh of March Speech as «probably the most important effort of my life.» By an almost unanimous verdict his admirers, many of whom disagreed with the political sentiments of the Seventh of March Speech, have given highest rank to the Reply to Hayne.

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**REPORTING.** See JOURNALISM; NEWSPAPERS, AMERICAN.

**REPOUSSÉ,** rẹ-pōō'sā'. A term taken from the French, meaning «beaten back.» It is used to designate the formation of raised (*relief*) ornament in metal on flat or hollow ware. In its stricter interpretation the term refers to that division of beaten relief work which is performed by hammering or punching on the reverse (negative) side of the metal. This is, therefore, embossing as contradistinguished from *chasing*, which latter process is the hammering or driving of the metal into recesses (depressing). Inasmuch as the relief ornament is, almost invariably, followed by a finishing process of chasing, the entire performance (of relief and intaglio work on a single piece) is, by extension, frequently termed repoussé work. The great esteem in which repoussé work of fine character is held by connoisseurs is enhanced by the knowledge that the quality of the production depends solely on the skill of the craftsman. The art dates back to very early history, and the ancients did very refined, delicate work in this process, as is proven by such examples as the Bernay Treasure (see SILVERWARE) and other finds of silver, gold and bronze art metal work (see BRONZES). To the Greeks the process was known as sphyrelaton. Repoussé work is about the most difficult the craftsman in metal can undertake, requiring great skill and patience to obtain fine execution, and for this very reason the great gold and silversmiths of all times have loved to display their skill in this medium; Greeks, Romans, Italians, Dutch. French and Germans have all left us grand examples. The golden altar in Cluny Museum, Paris (see ALTAR), is a beautiful 11th century example of repoussé work.

**Technique.**— As above stated, this process consists of hammering or punching embossed work from the reverse side. In efficient work the whole surface, both the relief and the background, should remain of equal thickness as near as possible. This involves hammering up the metal sheet (termed blank) to thicken, or reinforce, the parts which are to be in relief, so that, while covering a larger surface than the flat, the thickness of the «walls» may be maintained. Another chief difficulty to overcome is the fact that hammering on the metal tends to harden and cause «temper» or brittleness. A frequent «annealing» is, therefore, necessary. Annealing is the softening process brought about by bringing the metal to red heat, then «quenching» in «pickle» or water. In the case of copper the quenching can be done at red heat, but with brass or silver the metal should cool down somewhat. The first process in producing repoussé work is to get a copy of the required design on to the metal; for which there are several processes, but the simple methods of pasting the drawing on the metal or tracing it on to the surface with carbon paper and stylus, or a needle point, are commonly used for flat work. For hollow ware surfaces the work has to be done by freehand generally, using «dividers» for tracing the measurements. In the case of flat work, the blank is placed face downward, the design being on the reverse side, on a board which is faced with a composition which will yield to the blows of the tool yet maintain the surrounding surface to support the remainder of the metal. Usually a composition is used containing pitch (Stockholm or Swedish preferred) mixed with tallow or some other substance to soften it and overcome its tendency to brittleness; brickdust, plaster of Paris or resin are often used for this purpose. In high relief work the pitch must be kept warm so as to be sufficiently soft to take on deep impressions. But, in order to avoid the inconveniences of working on such a soft, sticky substance, lead, tin or zinc are frequently used to support the metal that is to be hammered into high relief. For surfaces which are not in the flat a «pitch bowl and ring» are used as support. A hemispherical bowl filled with the pitch is rested on a thick ring of leather, rope or other substance. This contrivance permits the worker to tilt the surface in any desired direction.

**Tools.**— At least two hammers are needed, one with flat face, the other a «chasing» hammer with handle ending bulb-shape; a wooden mallet can take the place of the latter. Punches and several kinds of chasing tools should be numerous if it is desired to avoid monotonous effects; a «tracer» and a «back grounding» tool are needed, and, to ease operations, at least 50 different punches are required (which are best shaped by the individual worker). Bossing and «cushion» tools vary in form (but the edges must be eliminated) and are used to produce bosses or ridges. «Modelling» and «chasing» tools have a flatter working end; «lining,» «freezing» and «matting» tools are used to produce «texture» on the surface and contain working surfaces in lines, grooves, hatchings, etc. «Ring» tools produce a depressed circular mark; «backgrounding» tools, of course, are for giving background texture. «Snarling irons» are for working in the interior of hollow ware (such as ewers, vases, etc.) and are made in elongated Z shape; they are fastened at one end in a vice the other end (which is provided with a knob or button) is inserted in the orifice of the hollow piece, pressing against the surface to be operated on. A blow of the hammer on the tool near the vice sets the free end in vibration whose percussion produces on the inside of the vessel a depression, therefore a corresponding embossing effect on the outer (positive) surface. Consult Gawthorp, ‹A Manual of Practical Instruction in the Art of Brass Repoussé Work for Amateurs› (London 1899); Horth, A. C., ‹Repoussé Metalwork: a Scheme of Sheet Metal Work for Schools and Amateurs› (London 1905); Maryon, H., ‹Metal Work and Enamelling› (London 1912).

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**REPPLIER,** rĕp'lēr, **Agnes,** American essayist: b. Philadelphia, Pa., 1 April 1855. She is of French descent and was educated at the convent of the Sacred Heart, Torresdale. Her essays are characterized by lightness of touch, a keen sense of the humorous side of a theme and not a little irony. She published ‹Books and Men› (1888); ‹Points of View› (1892); ‹In the Dozy Hours› (1894); ‹Essays in Idleness› (1893); ‹Essays in Miniature› (1892); ‹Varia› (1897); and ‹Philadelphia: the Place and the People› (1898); ‹The Fireside Sphinx›

(1901); ‹Compromises› (1904); ‹In Our Convent Days› (1905); ‹A Happy Half Century› (1908); ‹Americans and Others› and ‹The Cat› (1912), etc. She also compiled a ‹Book of Famous Verse› (1892), and was a contributor to the *Saturday Evening Post.*

**REPRESENTATION.** See MINORITY AND PROPORTIONAL REPRESENTATION.

**REPRESENTATION,** (1) the authorized acting by one person in behalf of another, as in a legislative assembly; also, the system of choosing such representatives. Representation in a modified form was known in ancient times, and the principle was extended by the Church, in its ecumenical councils. The Germanic nations, however, were the first to adopt political representation, having employed it in their popular assemblies. Later it spread to Great Britain and still later to the United States, in which latter country it developed into the representative democracy which still endures. Representation to-day is found not only in republics, as the United States, but in monarchies also, as Great Britain. In republics, however, representatives are less restricted in their power than in monarchies, it being usual in the latter to place a check in the form of an appointed or hereditary upper house to control legislation. In early times representation was largely by classes, and to-day this principle is still carried out to some extent in England. There is much conflict of opinion as to whether a national representative should follow closely the wishes of his constituents solely or whether he should, in case of conflicting interests, prefer to use his powers in a manner that would most benefit the entire country. The latter view appears to dominate, but it is nevertheless a fact that representatives, especially those seeking re-election, are largely influnced by the wishes of their constituency.

**Majority, Minority and Proportional Representation.**— In the United States the majority generally rules, and no provision is usually made for giving the proportionate representation to the minority that it would seem in all justice to require. It often happens, owing to the system of representation in vogue in the United States, that a party which casts less than 40 per cent of the votes in a Congressional or other election may have all the representation while the parties casting the remainder of the votes have no representation whatever. In Illinois an attempt was made to remedy this by the constitution of 1870, which provided for what is known as the «free vote.» This system, as applied in this State, affects the election of members of the lower house of the legislature only, and by the provisions of the constitution each voter may cast as many votes for each candidate as there are representatives to be elected or he may apportion such votes, or equal parts thereof, among the candidates, if he so desires, and those receiving the largest number of votes shall be elected, three representatives being chosen in each district. The chief objection to this method is that at best it gives only minority and not proportional representation, gives it solely to a very large minority and ignores third parties entirely. Another objection is that the politicians of the two leading parties have rendered the regulation practically valueless by manipulation in naming the candidates. For instances, in districts largely Democratic, the Democratic party makes but two nominations and the Republicans one, thus ensuring the election of two Democrats and one Republican in a very large preponderance of cases. Another method advocated for the reform of present methods is known as the «limited vote,» which has been used in England, and also in Pennsylvania in choosing Supreme Court judges, county auditors and other officials and in New York for the selecting of members at large to the Constitutional Convention of 1867. By this method each voter has less votes than there are offices to be filled. For example, where there are three offices, the voter has only two votes. This method, in a modified form, is in effect in a number of countries, among them Portugal and Spain. Another method, known as the «transferable vote» or «Hare system,» is complicated but much favored by advocates of the minority system. By this method a voter indicates his choice (1st, 2d, etc.) by number, after voting for as many candidates as he desires. The total number of votes cast is divided by the number of offices to be filled, and the quotient gives the «quota,» or number of votes necessary to elect a candidate. At the first count of votes, only the first choices are reckoned and those that receive at least a quota are declared elected. After this, if all the offices are not filled, the remaining votes of the candidates who have been declared are transferred to the candidate having second choice, and the process is continued until all the offices are filled. Tasmania adopted this method, for all elections in 1907, and it is in use also in Moravia, Denmark and Iceland. Another method, in use in Switzerland and elsewhere in Europe, is known as the «free-list» system. Under it any organized party may nominate as many candidates as it desires, but not to exceed the total number of places to be filled. Any voter may cast as many votes as there are candidates to be elected, but not more than one for any candidate. The total vote cast is then divided by the number of places to be filled, and this gives the quota of representation. The total vote cast by each party divided by this quota gives the number of representatives to which each party is entitled. For example, if 20 representatives are to be elected, with 1,000,000 voters in the district, the Democrats polling 400,000, the Republicans 350,000 and the Socialists 250,000, the quota is found by dividing the total votes cast (1,000,000) by the number of representatives to be chosen (20), equalling 50,000. This would give the Democrats eight representatives, the Republicans seven and the Socialists five. Other systems are in use which are modifications of those above described.

(2) *In law,* an oral or written statement of fact, as one made incidentally or collaterally to a contract. Whether express or implied, a material false representation made by one party to a contract, if acted upon and believed by the other party to his injury, will render such contract void; (3) the principle by which the lineal descendants of a deceased person inherit or take part of the estate which their ancestor would have inherited if he had survived.

**REPRESENTATIVE GOVERNMENT.** Representative government in the modern meaning of the term was unknown to the ancients. Kings, chiefs and administrative officers were often elected by popular vote or acclamation, but neither in ancient Greece nor Rome did a body exist even remotely resembling a Congress, a Parliament or a Reichstag. States which were not absolute despotisms were governed, as a rule, by a council of magistrates and a popular assembly, in which latter all persons with civic rights took part, and which was very much like a New England town meeting; but there is no instance of the popular assembly of ancient times developing into a representative body. The Roman Senate was composed of magistrates and ex-magistrates and resembled the American Senate of to-day only in name. This ancient system, which appears from the standpoint of to-day both unwieldy and unruly, was well enough fitted, however, for the so-called republics in which it prevailed, and in which all power was reserved to the central city, whether Athens, Thebes or Rome. The citizens in public assembly stood for the state, and were the state, and did not think it necessary to delegate their powers to representatives. When civic rule in Rome gave place to imperialism, the public assembly ceased to exist, while the Senate was retained to register the decrees of the Cæsars, and offer honorable retirement to those who had gained imperial favor.

Representative government, as we know it to-day, is not derived, therefore, from any Roman or Greek institution. It is essentially an outgrowth of that love of liberty inherent alike in Saxon, Norman and Celt, and reached its present development through centuries of struggle and of political and social evolution. The English Parliament, with its combination of mediæval House of Lords and 20th century House of Commons, has grown gradually from beginnings dating back almost to the Norman Conquest. The barons asserted their rights against tyrannical kings, and the necessities of the kings compelled them to recognize the well-to-do classes outside the nobility, who had the wealth of which the royal exchequer stood badly in need. Taxation gave birth to representation, and at length it became a recognized principle that Englishmen would not stand taxation imposed without their own consent through representatives in Parliament assembled. It was not, however, until far into the 19th century that the common people of England were permitted to have a voice in public affairs, and not until 1885 that the suffrage was bestowed on virtually all male subjects of adult age in the United Kingdom. The Parliament of to-day, therefore, represents the English people; less than half a century ago it represented only the privileged classes.

Representative government in the United States inherited its spirit from England, but not its form. The American system is of native origin. It developed from town-meeting to assembly, and when the new States adopted new fundamental laws, the upper house was called a senate, after the ancient Roman Senate, while the right of originating measures of taxation was reserved to the popular branch of the legislature. In the United States, also, however, the right or privilege of voting was generally restricted to taxpayers and property-owners for many years after independence, and in one of the States — Rhode Island — a landholding qualification for foreign-born citizens existed until a few years ago. Excepting some peculiar restriction intended to prevent negroes from voting in certain Southern States, nearly all male citizens of adult age now possess the right to vote. The second decade of the 20th century saw the extension of the suffrage to women in many States of the Union and the passage of the Federal amendment to the Constitution, in 1918, by which all women in the United States are enfranchised ends the long struggle in other States and confers the voting power on millions, making for a really representative government. See SUFFRAGE.

In the Hanseatic towns, in Switzerland, the Italian free cities, and other republics of the Middle Ages, representative government had no real existence so far as the common people were concerned, and the parliaments of modern Europe are not derived from the institutions of those states. The American Revolution gave the impulse and inspiration needed to awaken the people of Europe to a sense of their rights and wrongs and the constitutions granted by monarchs on the Continent to their subjects adopted as models a mixture of the English and American systems. Every European country at present has a congress or parliament in which the people are represented by deputies elected according to law. Japan has a similar system, and representative government, which 100 years ago was practically confined to the United States and England, is now coextensive with civilization in every continent. See DEMOCRACY; GOVERNMENT; and consult Beard, Charles A., ‹American Government and Politics› (New York 1910); Commons, John R., ‹Proportional Representation› (2d ed., ib. 1907); Garner, J. W., ‹Introduction to Political Science› (1910); McLaughlin, A. C., and Hart, A. B., ‹Cyclopedia of American Government› (3 vols., New York 1914); Stubs, W., ‹Constitutional History of England› (London 1897).

**REPRESENTATIVES, Election of.** See ELECTIONS; ELECTORAL QUALIFICATIONS; CONGRESS.

**REPRESENTATIVES, House of.** See HOUSE OF REPRESENTATIVES; CONGRESS OF THE UNITED STATES; SENATE, UNITED STATES; ASSEMBLY, LEGISLATIVE; LEGISLATURE.

**REPRESENTATIVES, State.** See ELECTORAL QUALIFICATIONS.

**REPRIEVE,** *in law,* a temporary suspension of the execution of a sentence after conviction of a crime, as by a governor or a sovereign; also, the instrument granting such suspension. The term to-day is usually applied with reference to sentences of death only. Reprieves are usually granted by the chief executive of a nation or state, among some of the reasons being: newly-discovered evidence affecting favorably the case of the condemned, pregnancy, insanity occurring after sentence of death and to allow time for the determination of facts after a pardon has been requested. Sometimes the court which tried the prisoner may grant a reprieve.

**REPRISALS,** *in international law,* (1) forcible seizure and retention of the goods of an enemy in retaliation or as satisfaction.

While it is an act of war, it is usually resorted to for the purpose of avoiding war and is always accompanied by force, as by the seizure of property. Sometimes naval forces are landed on territory of the offending nation and the custom-house and other public buildings are taken and held until satisfaction has been secured. Compensation should first be demanded by a state before resort is had to reprisal. (2) A retaking of one's own property by force.

**REPROACHES,** or **IMPROPERIA** (a Latin word of the same meaning), in the Roman Missal, a part of the divine service which on Good Friday is substituted for the usual daily mass. While the clergy and people are paying veneration to the representation of the Crucified before the high altar, two pairs of choristers chant alternately a series of antiphons, to which two choruses respond in versicles, Greek and Latin alternately, then repeating part of the antiphon. There are 12 Improperia, the first being: «My people, what have I done to thee? or wherein have I vexed thee? For that I led thee out of the land of Egypt, thou has provided a cross for thy Saviour.» Again: «I lifted thee up with mighty power; and thou hast hanged me on the gibbet of the cross.» These reproaches were first sung to plain-chant melodies, preserved in the 'Graduale Romanum,' and still extensively used, but in the Sistine Chapel, since 1560 they have been sung to some exquisite «faux bourdons,» to which they were adopted by Palestrina.

**REPROBATION,** a dogma of the Calvinistic creeds, which teaches the predestination of some of the children of Adam to be eternally lost. Though the word reprobation is not used in the Westminster Confession of Faith and does not occur in the Authorized Version or Revised Version, the definite reprobation of those who are not predestinated to everlasting life is unequivocally expressed in this passage of the Confession (iii, 7): «The rest of mankind» — that is, all but the elect to everlasting happiness —«God was pleased, according to the unsearchable counsel of his own will, whereby he extendeth or withholdeth mercy as he pleaseth, for the glory of his sovereign power over his creatures to pass by and to ordain them to dishonour and wrath for their sin, to the praise of his glorious grace.» Among the passages of the New Testament that are cited in support of this doctrine are Rom. ix, 11–22; 1 Thess. v, 9; 1 Pet. ii, 8; Jude 4.

**REPRODUCTIVE ORGANS.** See ANATOMY, COMPARATIVE.

**REPTILES,** or **REPTILIA,** a class of vertebrate animals. Although no two groups of *Vertebrata* are more dissimilar in general appearance and habits, and to the popular mind might seem more unrelated than the birds and reptiles, they are, by common consent of modern systematists, combined in a superclass, the *Sauropsida,* of Huxley, or the *Monocondylia,* of Haeckel and Cope. The *Sauropsida* are distinguished by the possession of lungs, gills being permanently absent. The embryo possesses an amnion and allantois, the former being a sac investing the body, the latter a structure developed from the lower surface of the embryo and serving for respiration. The lower jaw in *Sauropsida* is compound in that each half or ramus consists of a number of distinct pieces; while in mammals each half consists of but a single piece. The lower jaw in reptiles and birds further articulates with the skull, not directly, but through the intervention of a separate and distinct bone, the os quadratum or quadrate bone. The skull is joined to the spine by one condyle only; two such condyles exist in amphibians and mammals. As compared with the fishes and batrachians the basal axis of the brain-case is bony instead of cartilaginous and the parasphenoid bone is absent. The bodies of the vertebræ are formed chiefly of centra (that is, are gastrocentrous) instead of intercentra (notocentrous) as in the *Amphibia.* Very rarely and only in extinct forms is the notochord persistent. The anklejoint is placed in *Sauropsida,* not as in mammals, between the tibia and the astragalus, but between the proximal and distal parts of the tarsus which in *Sauropsida* becomes thus divided. The coracoid bone is almost always well developed. The intestine ends in a cloaca. No complete diaphragm is developed to separate the thorax from the abdominal cavity. The corpus callosum uniting the halves or hemispheres of the cerebrum is rudimentary, no mammary glands exist and the *Sauropsida* are oviparous or ovo-viviparous. Such are the characters common to birds and reptiles.

**Comparison with Birds.**— Reptiles differ from birds in the following characters, which may, therefore, be taken as including the definition of the class *Reptilia.* The covering consists of horny scales or of bony plates (scutes), but never of feathers. The blood is cold and two aortic arches (right and left) exist in living *Reptilia.* The heart is three chambered in all save the crocodiles, which possess a four-chambered heart. But in all reptiles, without exception, the venous and arterial currents of blood are connected and an impure or mixed blood is thus circulated throughout the body. The lungs do not present the open character of those of birds, but, like those of mammalia, are in modern reptiles almost always closed sacs. The tarsal and metatarsal bones of the hind limbs, which in birds are united to form a single bone, are distinct and separate in the great majority of reptiles. When a sacrum exists it bears sacral ribs, which articulate with the ilia or haunch-bones.

**Skeleton.**— The body in reptiles is generally elongated, the tortoises and their allies presenting the most notable exceptions to this rule. The limbs may be entirely wanting, as in most snakes and in many lizards; or only a pair of limbs may be developed, as in some lizards; while in most other reptiles all four members are present. The bones of reptiles are more compact than those of lower vertebrates. In the reptilian skeleton the five different regions into which the spine is ordinarily divided are to be recognized, except in the serpents and a few others. There are seldom more than two sacral vertebræ, and free cervical ribs are usually present. The epiphysial and other sutures of the vertebræ are retained through life. The bones of the shoulder-girdle of each side include a simple or divided scapula or shoulder-blade and an often complex coracoid bone, including precoracoid and epicoracoid, the latter bone of each side articulating with the sternum or breast-bone when the latter is present.

In addition a clavicle and interclavicle may be present. The fore-limbs consist each of a humerus, radius and ulna, the carpal bones and normally five digits. The pelvis contains its three typical elements, ilium, ischium and pubis, the first being often of larger size and the last usually forming a symphysis. In serpents the shoulder-girdle is totally absent and vestiges of the pelvic-girdle appear only in a few instances; and in the turtles both are enclosed within the shell, except that the clavicle and interclavicle form part of the plastron. The limbs are usually adapted for running, but sometimes for leaping and in the extinct pterodactyls for flight. In the extinct marine pelagic reptiles, and in the modern sea-turtles, they are paddle-like. The ribs in reptiles are always present, but may differ greatly in form and dispostion, those of the turtles, for example, contributing toward the formation of the upper shell or carapace.

**Skull.**— The skull of *Reptilia* possesses but a single occipital condyle, which is sometimes tripartite. The quadrate bone is generally firmly fixed to the skull, joining the squamosal bone, but is freely movable in serpents and only less so in many lizards. Each half or ramus of the lower jaw is composed of dentary, angular, surangular, coronoid, splenial and articular bone. Other regions of the skull are modified in the greatest varieties of ways in the several orders, the most important from a systematic standpoint being in the bones which form the complex roof of the temporal fossa. Primitively this roof is complete as in the stegocephalian-batrachians, but by the formation of one or two openings (supra- and infra-temporal vacuities) it is divided into one (*Synapsida*) or two (*Diapsida*) longitudinal bars behind the orbits. Through variations in the size and position of these openings, to which may be added emarginations, this region is modified, and may even practically disappear altogether, as in the snakes.

**Digestive Organs.**— The teeth are generally well developed, but in the *Chelonia* are wanting, the jaws, like those of birds, being ensheathed in horn. The reptilian teeth, like those of lower *Vertebrata* generally, are adapted less for mastication than for merely retaining prey while it is being swallowed. Save in the crocodiles and in some extinct forms the teeth are not implanted in sockets or *alveoli,* but are attached in various ways and by bony union to the jaw-bones. Teeth may be borne by bones other than the jaws (for example, palate bones); and, as seen in the poison-fangs of serpents, may be modified for special purposes. The teeth vary greatly in number and are not persistent, new teeth being produced in regular order (as in crocodiles) from a growing pulp at the base of the socket, the new tooth displacing the old.

The tongue may be elongated, distensible and bifid, as in many lizards and serpents; short, thick and non-protrusible, as in other lizards; or completely attached and fixed throughout its entire extent, as in *Crocodilia.* The œsophagus or gullet is usually greatly distensible (as in serpents), and may be covered (as in some *Chelonia*) with retroverted spines. The stomach is mostly pyriform or pear-shaped, and (as in snakes) may, like the gullet, be capable of great distension. In *Ophidia* it exhibits an anterior dilated part, with thin walls for receiving nutriment, and a posterior hinder portion with non-distensible walls provided with glands and adapted for digesting the food. In the crocodile the stomach resembles the gizzard of a grain-eating bird in its high muscularity.

**Circulation.**— The heart in reptiles consists of two auricles (right and left) and a ventricle, except in the *Crocodilia,* in which two auricles and two ventricles are developed. The aortæ or main arterial trunks exist, and are respectively named right and left aorta. These chief vessels bend around the gullet and unite to form a single and common main-trunk for the supply of blood to the system generally. But the chief peculiarity in the circulation of all reptiles consists in the peculiar mixture of arterial with venous blood, which takes place in the aorta in such a manner that the head alone is supplied with arterial blood. The reptiles exhibit sluggish habits, slow respiration and a series of vital actions marked by no active conditions demanding a more perfect circulation or highly-oxygenated blood. The blood is cold (poikilothermic) in reptiles, that is, but little higher in temperature than the surrounding medium, with changes in which it varies. The red blood-corpuscles are oval and nucleated.

Respiration in reptiles is carried on solely by means of lungs, the presence of branchiæ or gills in early life, and sometimes in the adult life also of batrachians, constituting a marked difference between these latter and reptilian forms. In the *Crocodilia, Chelonia* and most lizards, the lungs are equally developed, but in serpents and some lizards only one lung is fully developed, the right lung being usually abortive. The lungs may, as in snakes and other *Reptilia,* in which the body is elongated, be of proportionally large size, and may extend nearly throughout the whole length of the body-cavity which is not separated by a complete diaphragm into a distinct thorax and abdomen. In the crocodiles, lizards and serpents the respiratory action is carried on through movements of the walls of the trunks. But in turtles, in which no movements can take place, air is drawn into the lungs by a process analogous to swallowing. The larynx or organ of voice is simple in structure, no vocal cords being in general developed, although these organs appear in crocodiles and some others.

**Brain and Sense-Organs.**— In the higher *Reptilia* the cerebrum attains a comparatively larger size than in the lower forms, while the cerebellum also attains a relatively higher development as we proceed upward. The cerebellum has no lateral lobes nor pons, while the corpora bigemina and thalami are of large size. The senses are developed in tolerable perfection. The nasal cavities are of large size and open into the mouth through either the anterior or posterior part of the palate. In the *Crocodilia* the hinder nostrils open very far back in the mouth, enabling these animals to hold their prey under water in their mouths, and so to drown it, while their own respiration is carried on unimpeded through the nostrils. The eyes are usually of small size, and exhibit variations in structure and in the disposition of the protective coverings. Thus in snakes the eye-ball in front is covered by a transparent lid, formed by a layer of the skin, which is attached to a circle of surrounding scales, and is shed periodically, with the outer skin. In snakes the pupil of the eye is round. In the lizards movable and ordinary eyelids exist, while the turtles possess a nictitating membrane. In lizards and snakes the sclerotic coat of the eye is strengthened by a circle of bony plates, such as also occur in several extinct reptilian forms and in birds. In the chameleons the single eyelid is formed by the united lids, and through an opening in this circular lid the rays of light enter the pupil of the eye within. The tympanum of the ear is imperfectly developed in *Ophidia,* and no eustachian tube exists. In lizards the tympanic apparatus is better developed, while in chelonians the tympanic cavity is large and complicated, and a rudimentary cochlea exists. The *Crocodilia* possess a movable valve, by means of which the tympanic canal of each ear can be closed at will; and most of the structures found in the ear of higher *Vertebrata* are represented in greater or less structural detail and perfection.

**Viscera.**— The kidneys are generally placed far back and deep within the pelvic cavity. In the serpents, however, the kidneys are situated anteriorly, and are unsymmetrically placed, the right being higher up and in advance of the left kidney; they also are divided into small lobes. No urinary bladder exists, and the urine of the lizards is fluid; that of the serpents resemble the excrement of birds in being pasty and crystalline. In *Crocodilia* the testes are elongated, and placed in front of the kidneys. The penis in *Crocodilia* is single, grooved and contained within a special cloacal fold; in *Ophidia* two lateral penes exist, and these are hollow and evertible; a double penis exists in lizards, while that of turtles is single.

The eggs are generally of relatively large size, and provided with a thick parchment-like shell and a large yolk. In many instances the eggs may be deposited in sand and hatched by the sun's heat.

**Distribution.**— With regard to the distribution in space of reptiles, the warm or tropical regions of the earth contain these animals not only in greatest number, but in most typical form and variety. During winter or in the colder seasons of the year, most reptiles hibernate and many desert species also pass into a summer sleep. Reptiles are varied in their habits, most of them being terrestrial, but many arboreal and some, including the great majority of the turtles, are aquatic. While most are strictly carnivorous or insectivorous, some subsist on a general diet and a few are purely vegetarian. Many of the extinct forms fed exclusively on fishes. Reptiles exhibit many interesting habits, but, owing to a popular prejudice against them and the tax on the patience of the observer resulting from their inactivity and secretiveness, they have been comparatively little studied.

**Classification.**— Because of certain resemblances in form and manners, all of the early zoologists, to and including Cuvier, classed the *Reptilia* and *Amphibia* together, and it was only when embryological data began to play an important part in taxonomy that their dissimilarity was perceived. Milne-Edwards and his contemporaries toward the middle of the 19th century were the first to recognize this in a scheme of classification. In 1860–70 when zoologists were still working under the fresh stimulus of the publication of the 'Origin of Species,' Huxley, Haeckel and Cope almost simultaneously perceived much more clearly than had any of their predecessors the close relationship and probable community of descent of birds and reptiles. Reptilian life played a much more important rôle in past ages of the earth than now, that it is not surprising that we must turn to palæontologists for nearly all of the recent advances in the classification of the groups. The scheme and nomenclature mainly followed in this work is that elaborated by Gadow in Vol. VIII of the 'Cambridge Natural History.'

### CLASS REPTILIA.

Subclass *Proreptilia.*

Subclass *Prosauria.* Orders: Microsauri, Prosauri (Rhynchocephalia, etc.).

Subclass *Theromorpha.* Orders: Pareiasauri, Theriodontia, Placodontia, Anomodontia.

Subclass *Chelonia* (Turtles). Orders: Athecа, Thecophora.

Subclass *Dinosauria* (Dinosaurs). Orders: Sauropoda, Theropoda, Orthopoda, Ceratopsia.

Subclass *Crocodilia* (Crocodilians). Orders: Pseudosuchia, Parasuchia, Eusuchia.

Subclass *Plesiosauria.* Orders: Nothosauri, Plesiosauri.

Subclass *Ichthyosauria.* Orders: Ichthyosauri (Fish-lizards).

Subclass *Pterosauria* (Flying Reptiles). Order: Pterosauri (Pterodactyls).

Subclass *Pythonomorpha,* Orders: Dolichosauri, Mosasauri.

Subclass *Sauria.* Orders: Lacetilia (Lizards); Ophidia (Serpents).

A more elaborate scheme, but one which more correctly expresses the natural relationships of the orders, has been developed by Cope, Baur and Osborn.

The vast majority of reptilian types have become extinct. Only four orders are represented in our modern fauna, and one of these, the *Rhynchocephalia,* by only a single species, the New Zealand tuatera. The *Crocodilia* have greatly declined in variety of forms since the close of the Mesozoic Age. The *Pythonomorpha* have become extinct, but lizards and snakes are represented in the saurian orders by a great number of species and are the only dominant reptilian types. Reptiles flourished especially during the Mesozoic Age, to which four of the most remarkable groups were confined, the great marine reptiles (*Plesiosauria* and *Ichthyosauria*), the huge and often remarkably modified terrestrial *Dinosauria* and the equally wonderful flying *Pterosauria.* This epoch, when the seas were shrinking and dry land increasing in extent, but when the atmosphere was heavy with moisture and carbonic-acid gas, unfitted for the respiration of high types of life, was well suited for the development of the sluggish reptiles; and they were dominant on land and sea, replacing on the one hand the amphibians and on the other the primitive types of fishes of earlier ages. With the close of the Age of Reptiles and the advent of the Eocene Period, mammals quickly rose to full dominance on the land and many orders of reptiles, having played their parts in the evolution of life, disappeared forever. Reptiles sprang from the stegocephalian *Amphibia*. From some group of the *Theromorpha* (of the synapsidan series) mammals are supposed to have come; while birds took their origin from the diapsidan line, probably in common with some primitive dinosaurian.

Consult, besides the numerous articles in this work on special orders and kinds of reptiles, the following: Cope, ‹The Crocodilians, Lizards and Snakes of North America,› Report of United States National Museum (Washington 1900); Holbrook, ‹North American Herpetology› (Philadelphia 1842); Gadow, ‹Amphibia and Reptiles› (New York 1901); Boulenger, ‹Catalogue of the Reptiles in the British Museum› (London 1889–96); Osborn, ‹The Reptilian Subclasses Diapsida and Synapsida,› Memoirs American Museum of Natural History (New York 1903); Woodward, ‹Vertebrate Palæontology› (Cambridge 1898).

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**REPTILES, Eggs of.** See Egg.

**REPTON,** a village of Derbyshire, England, about eight miles southwest of Derby; it was once an Episcopal see, capital of the kingdom of Mercia and had a celebrated nunnery from 660 till its destruction by the Northmen in 874. From 1172 till the dissolution of the monasteries under Henry VIII it was the seat of a priory of Austin friars; part of the priory buildings is incorporated in the fabric of the Repton free grammar school, founded in 1556, one of the great English public schools. The parish church of Saint Wystan is notable for its curious crypt, consisting of a centre and side isles divided by three arches on either side and supposed to date from the reign of Edgar. Pop. 1,695.

**REPUBLIC,** a word signifying a state in which the people are the source of power. The degree of popular sovereignty in republics has varied very widely in the past, most of the so-called republics having been ruled by an aristocracy which jealously guarded its own rights, but treated the multitude as little better than slaves. Real republican government may be said to date from the American Declaration of Independence, and even in the United States the government was largely one of class until about the second quarter of the 19th century, when suffrage barriers began to break down. The other so-called American republics have been so far mostly military despotisms, in which order or disorder was maintained by force under the command of a successful general. But the force of true republicanism has been slowly growing in all the ancient Spanish possessions. Argentina, Chile and Brazil are also gradually becoming inspired by the real republican spirit, while Cuba, the youngest of American republics except Panama, which has just been admitted to the family of nations, is making an excellent record.

As an instance of the way in which the term «republic» was used or abused in the past, it may be mentioned that Poland was formerly called a republic because the king was elected by the nobles. In the 18th century it was not uncommon to designate the German Empire by the appellation of the «republic of princes.» The large commercial cities of Italy, Genoa and Venice were called republics because they were governed by an aristocracy of noble families, who appointed one of their number to be supreme chief of the state, as the *doge*. The republican institutions of the greater part of the Greek states, as well as that of Rome, at least in later times, were of a more democratic character.

Of the tiny republics of the world San Marino is the best known. It is situated in central Italy, and its territory covers about 33 square miles and the population numbers about 8,500 souls. This miniature state was founded in the 4th century by Saint Marinus, who, having embraced Christianity, fled there to escape the persecution under Diocletian. The capital, San Marino, is on the crest of a mountain over 2,000 feet high and has a population of 1,200. It is one of the most picturesque places in the world, being perched on perpendicular cliffs.

The small half French and half Spanish republic of Andorra, which lies in an almost inaccessible valley of the eastern Pyrenees, possesses a charter of rights dating from Charlemagne in 790. See Free Cities; San Marino; Andorra; Republics, The History of; Republics, Duration of; Democracy; Government; Constitution of the United States.

**REPUBLICAN,** the river which unites with Smoky Hill River, at Junction City, Kan., to form the Kansas River. The Republican is formed by two streams which unite in east central Colorado. The river flows northeast into Nebraska, then east and southwest, entering Kansas at Superior in Jewell County, continuing south, east and southeast to the Kansas River, uniting with that stream in Gary County, about three miles below Junction City; estimated length, 550 miles.

**REPUBLICAN PARTY, The.** The Republican party was an inevitable outgrowth of the conditions which prevailed about the time of the repeal of the Missouri Compromise in 1854. The Whigs, incapable of grappling with new problems, were rapidly disintegrating; no one of the sporadic parties sprouting in the political confusion of the time was based on broad enough principles to become a truly national organization; the Republican party, germinating in the Free Soil movement and inheriting Whig and Federalist traditions, happily combined the inspiration of a great moral idea with the enduring quality of sane policies in Federal administration. Its origin cannot properly be ascribed to any particular date or place. The first known suggestion of the name was in a letter written by Horace Greeley. The earliest convention of importance to adopt it was held at Jackson, Mich., 6 July 1854. Virtually coincident with the Michigan convention there were conventions in Maine, Illinois, Massachusetts, Ohio, Indiana, Wisconsin and Iowa; almost spontaneously the Republican party had become a strong national organization. On the roster of the 33d Congress, the name «Republican» does not appear; in the 34th Congress, which met 3 Dec. 1855, there were in the Senate 15 Republicans, 42 Democrats and 5 Americans; in the House of Representatives there were 108 Republicans, 83 Democrats and 45 Americans. The Whigs had disappeared. Nathaniel P. Banks of Massachusetts was chosen speaker of the House by a combination of Republicans and Americans, after a memorable contest. Steps were taken at once to put a ticket in the field for the approaching election of President. The chairmen of the State committees of Maine, Vermont, Massachusetts, New York, Pennsylvania, Ohio, Michigan, Indiana and Wisconsin called an informal convention to meet at Pittsburgh, 22 Feb. 1856. A committee appointed at that meeting called a national convention to meet at Philadelphia, 17 June 1856, to nominate candidates for President and Vice-President. The call was addressed to «the people of the United States, without regard to past political differences or divisions, who are opposed to the repeal of the Missouri Compromise, to the policy of the present administration, to the extension of slavery into the Territories, in favor of the admission of Kansas as a free State, and of restoring the action of the Federal government to the principles of Washington and Jefferson.» John C. Fremont, of California, was nominated for President, and William L. Dayton, of New Jersey, for Vice-President, on a platform the most conspicuous plank of which read as follows:

> "Resolved, That the Constitution confers upon Congress sovereign power over the territories of the United States for their government and that in the exercise of this power it is both the right and the imperative duty of Congress to prohibit in the territories those twin relics of barbarism, ploygamy and slavery."

It was essentially a one-idea convention, although resolutions were adopted favoring national aid for a railway to the Pacific Coast, and liberal appropriations for rivers and harbors; but the party was not long to remain thus limited in its mission. The convention of 1860, which nominated Abraham Lincoln for President, adopted resolutions which committed the new party to the doctrine of a protective tariff, in the following clause:

> "That, while providing revenue for the support of the general government by duties upon imports, sound policy requires such an adjustment of these imposts as to encourage the development of the industrial interests of the whole country; and we commend that policy of national exchanges which secures to the workingmen liberal wages, to agriculture remunerative prices, to mechanics and manufacturers an adequate reward for their skill, labor, and enterprise and to the nation commercial prosperity and independence."

The Republican party is thus seen almost from the beginning to have been committed to the protective policy which remains to-day one of its cardinal principles. The election of 1856 resulted in a Democratic victory. James Buchanan received 174 electoral votes; Fremont received 114. It is perhaps fortunate that the new party did not then meet with success. Their candidate was a popular hero. No better name could have been selected about which to rally a new party alive with the crusading spirit. Had the party been successful in 1856, however, the Civil War would doubtless have begun then, and Fremont by temperament and experience was ill-fitted to grapple with such a problem. The inspiration of the campaign which he led carried the Republican party up to the momentous success of 1860. When the clouds broke, Lincoln providentially was at the head of the state, endowed beyond all other men of his time with the peculiar genius required to cope with the storm. The national convention at Chicago, 16–18 May 1860, nominated Abraham Lincoln, of Illinois, for President, and Hannibal Hamlin, of Maine, for Vice-President. In the election which followed Lincoln and Hamlin received 180 electoral votes; all others received 123 electoral votes. In April immediately following Lincoln's inauguration Fort Sumter was fired upon and the Civil War began. The war occupied the four years of Lincoln's administration. The Republican party was not only charged with the heavy work of administration, but it was responsible for the preservation of the government. When it entered upon the war, the government was without military preparation. Congress and the President were compelled to build navies, raise armies, to provide money and to fight the battles of the republic. They were hampered by secession sympathizers in the South, and «copperheads» in the North, although the masses of the Democratic party and many of its leaders were thoroughly loyal. Lincoln called into his Cabinet Democrats like Stanton, Blair and Welles, and gave high military command to loyal officers with Democratic affiliations. Logan, McClernand, McClellan and Butler were cases in point. Had it not been for this broad and statesmanlike attitude of Lincoln, who always acted on the theory that he was President of all the people, it may be doubted whether the Union would have been preserved. In the midst of the war, on 1 Jan. 1863, the proclamation of Emancipation went into effect. An election for President was held in November 1864. The Democratic party nominated Gen. George B. McClellan of New Jersey, for President, and George H. Pendleton, of Ohio, for Vice-President. The principal plank of its platform was a blunt declaration that the war was a failure. The Republicans at Baltimore, 7 June 1864, renominated Lincoln for President, with Andrew Johnson, of Tennessee, for Vice-President. During the early days of the campaign, while military success seemed to be still far away, Lincoln, believing that he was likely to be defeated at the polls, began preparations for a Democratic successor, pledging himself to do everything in his power in the few months remaining to him to carry through the war and save the Union. His fears were not justified by the results. Lincoln received the electoral vote of every State not in the rebellion except Kentucky, Delaware and New Jersey — 212 electoral votes; McClellan received 21.

The assassination of Lincoln, 14 April 1865, was a calamity not only to the country but also to the Republican party, upon which was pressing at the moment the problem of reconstruction growing out of the Civil War. Lincoln had the qualities needed at that time — firmness, moderation and political sagacity. Andrew Johnson, who succeeded to the Presidency, was ill-fitted either by temperament or by training to deal with the delicate questions which then arose. He was hotheaded, uninformed and unstable. He was soon at odds with the leaders of his party in Congress, and by his obstinacy drove them to extremes which might have been avoided had the executive been guided by a broader intelligence. All the measures of reconstruction were forced through in spite of the President's opposition. The difference became so marked that in February 1868 articles of impeachment were brought against the President by the House of Representatives. In the impeachment proceedings in the Senate the President was not convicted. The vote was: Guilty, 35; not guilty, 19 — one less than the two-thirds majority required by the Constitution for conviction.

Ulysses S. Grant, of Illinois, the victorious commander of the Union armies, was the unanimous choice of the Republican National Convention, which met at Chicago 20–21 May 1868. Schuyler Colfax, of Indiana, was the candidate for Vice-President. In the election which followed Grant and Colfax received 214 electoral votes. Seymour and Blair, the Democratic candidates, received 80. Throughout Grant's first administration, both Senate and House were strongly Republican. The 15th Amendment to the Constitution, having been recommended by Congress and adopted by the States, was proclaimed on 30 March 1870. To Grant fell the task of bringing the Southern States into adjustment with the reconstructed Union. The problems of his first administration were largely those which grew out of this new relationship. The former slaves in Southern States exercised for the first time their newly-acquired privileges of voting. The State governments of negroes and «carpet-baggers» which were set up became a scandal. The outrages committed by Southern Democrats upon all Republicans of whatever color aroused the resentment of the North, and kept the South in a condition of disorder which necessitated constant Federal interference.

The situation in the South, coupled with differences between the administration and certain Republican leaders, conspicuous among whom were Charles Sumner, Carl Schurz and Horace Greeley, caused a defection in the Republican ranks. The discontented Republicans met at Cincinnati in May 1872, and nominated Horace Greeley, of New York, for President, and B. Gratz Brown, of Missouri, for Vice-President. The platform declared that sectional issues should be buried, that civil service reforms should be inaugurated and that specie payments should be immediately resumed. The Democratic convention at Baltimore, in July, accepted the Liberal Republican candidates and platform. The regular Republican convention at Philadelphia, 5–6 June, renominated Grant for President by acclamation, and put Henry Wilson, of Massachusetts, on the ticket with him. Grant and Wilson received 286 electoral votes out of 366. The first two years of Grant's second administration witnessed a strong reaction against the Republican party. There was a financial panic in 1872 and 1873, and the scandals of the whisky ring in the Treasury Department, and of the post tradership in the War Department, involving men close to the administration, created a strong feeling of dissatisfaction throughout the country, which resulted in a political overturn in 1874. In the 44th Congress for the first time since 1860 the House of Representatives contained a Democratic majority.

Notwithstanding these adverse influences, Grant's administration in constructive achievement has hardly been equaled by any other. He established our monetary system on a sound basis through his veto of the Inflation Bill in 1874 and through the enactment, in January 1875, of a law providing for the resumption payments by the redemption of greenbacks in coin. With the co-operation of Hamilton Fish, the Secretary of State, he carried through a strong, far-seeing foreign policy. There has never been a period in American history when an American citizen could count more surely on world-wide respect. He secured satisfaction from Spain for the seizure of the *Virginius* and the execution at Santiago, Cuba, of American citizens among her passengers. Through the Treaty of Washington and the creation of the Geneva Tribunal to pass on the *Alabama* claims, he was first in history to establish arbitration in the settlement of international disputes. By the appointment of a Civil Service Commission he was the first President to give official recognition to Civil Service reform — to the principle of fitness in official appointments rather than selection for partisan political activity. He urged the upbuilding of an American merchant marine through ocean mail subsidies. He enforced the laws, maintained economy in government expenditures, lowered taxes and reduced the national debt.

By the time the Presidential election of 1876 arrived the Republican party had regained some of the ground it had lost. Rutherford B. Hayes, of Ohio, was nominated for President in the convention at Cincinnati, 14–16 June 1876. William A. Wheeler, of New York, was nominated for Vice-President. The Democratic candidates, nominated at Saint Louis, were Samuel J. Tilden, of New York, and Thomas A. Hendricks, of Indiana. The Democrats went into the campaign with a cry of «Turn the rascals out.» In the election which followed Tilden and Hendricks received a majority of the popular vote. There was a dispute in regard to the electoral votes of South Carolina, Florida, Louisiana and Oregon. The disputed votes were finally referred to an electoral commission, composed of five senators, five representatives and five justices of the Supreme Court. After a long hearing, during which the country was in great excitement, the commission held that it had no authority to go behind the returns, upon which the choice of electors had been certified. With this decision all the contested votes were awarded to Hayes and Wheeler, and they were declared elected, receiving 185 electoral votes. Tilden and Hendricks received 184 votes. The administration of President Hayes is notable for two reasons. He withdrew Federal troops from the South, thus leaving the negro voters at the mercy of the white population. The Southern States, which under reconstruction had been Republican up to 1876, now passed under Democratic control, and have remained Democratic with only occasional exceptions, ever since. Under the administration of John Sherman, as Secretary of the Treasury, specie payments, assured by legislation urged and made law by Grant, were resumed, and the finances of the government were fixed firmly on a substantial foundation. President Hayes had to deal with a Democratic House of Representatives throughout his term.

In the election of 1880, James A. Garfield, of

Ohio, and Chester A. Arthur, of New York, nominated at Chicago, 2–8 June, were chosen President and Vice-President, respectively, receiving 214 votes against 155 electoral votes cast for Hancock and English, their Democratic opponents. They also received a plurality of the popular vote. For the first time since 1874 the Republicans controlled the House of Representatives. The Senate was evenly divided. President Garfield was shot on 2 July 1881, and died on 19 September, leaving the administration in the hands of President Arthur. During Arthur's administration the Civil Service Commission was created and effective steps were taken to divorce the great body of subordinate offices in the civil service from the changes incident to party politics. Under the administration of William E. Chandler, as Secretary of the Navy, the building of the new navy was begun. A treaty was negotiated with the government of Nicaragua, looking to the construction of an inter-oceanic canal. This treaty had not been ratified by the Senate when the administration came to an end, and President Cleveland promptly withdrew it upon entering the White House. The administrations of Garfield and Arthur were marked by factional differences in the Republican party. The elections for Congress in 1882 resulted adversely, and in the 48th Congress there was a Democratic majority of 73. Grover Cleveland was elected governor of New York by a majority of nearly 200,000 over Secretary Folger, who had been nominated for governor through administration influence. In the election of 1884, Blaine and Logan, the Republican candidates for President and Vice-President — nominated at Chicago, 3–6 June — were defeated by Cleveland and Hendricks, the Democratic candidates, receiving 182 electoral votes as compared with 219 for their opponents. The campaign was fought almost solely on the personality of Mr. Blaine, and had never been exceeded in bitterness. The result was determined by a plurality of 1,149 in a total vote of 1,200,000 in the State of New York. The Democrats controlled the House throughout the Cleveland administration, but the Republicans had a majority in the Senate, a combination which prevented affirmative legislation of any consequence. President Cleveland brought the tariff question sharply to the front in his message of 1887, and the agitation which grew out of that message resulted in a campaign fought on the tariff issue in 1888. The Republicans in that year, in a convention at Chicago, 19–25 June, nominated Benjamin Harrison, of Indiana, for President, and Levi P. Morton, of New York, for Vice-President. The Democrats renominated President Cleveland, and placed Allen G. Thurman, of Ohio, second on the ticket. Harrison and Morton received 233 electoral votes; Cleveland and Thurman received 168. Both Senate and House were strongly Republican. The administration of President Harrison was signalized by the enactment of important legislation and by a strong foreign policy. Thomas B. Reed was speaker of the House of Representatives in the 51st Congress, with a narrow Republican majority. The Democratic minority essayed at the beginning of the Congress to prevent all Republican legislation by appealing to the technicalities of antiquated rules. Speaker Reed, in the face of vehement opposition, secured the adoption of new rules, under which it became possible for the majority to do business. The Reed rules, although angrily assailed by the Democratic minority, were adopted by the Democratic party when it next came into control of the House, and they prevailed for nearly 20 years. Having obtained the power to legislate, the Republican party in the House proceeded to enact a tariff bill in obedience to the command of the electorate. The McKinley Act was signed 1 Oct. 1890. A law was passed, known as the Sherman Anti-Trust Law, providing penalties for creating combinations in restraint of interstate trade. The House of Representatives passed a bill looking to the more efficient control of Federal elections. This measure aroused great Democratic opposition. It failed to pass the Senate. During Harrison's administration a revolution in Hawaii resulted in the deposition of Liliuokalani, the native queen. A republic was set up, and a commission was sent to Washington seeking annexation to the United States. President Harrison made a treaty of annexation, which the Senate failed to ratify in the few weeks remaining of the administration. The treaty was withdrawn by President Cleveland and the queen was restored to the throne, but Hawaii was finally annexed shortly after the return of the Republican party to power in 1897.

The Congressional elections of 1890 were fought on the issue created by the McKinley bill. In the 52d Congress the House contained 235 Democrats and only 88 Republicans. The election of 1892 resulted in turning all branches of the government over to the Democratic party. Cleveland and Stevenson were elected President and Vice-President, receiving 277 electoral votes; Harrison and Reid, nominated at Minneapolis, 7–10 June 1892, received 145 votes. Both House and Senate were strongly Democratic in the 53d Congress. The administration had come in on a platform which denounced protection as a fraud and declared it to be a fundamental principle of the Democratic party that the Federal government has no constitutional power to impose and collect tariff duties except for the purposes of revenue only. The election of a Democratic President on this platform created distrust in business circles and caused a paralysis of industry which resulted in a financial panic, hitherto unequaled, during the spring of 1893. President Cleveland, believing that the financial depression was due to the operation of the Sherman Act, which provided for the purchase of silver bullion, called a special session of Congress to repeal that act. The Republicans in the House and Senate combined with a small number of Democrats to carry out the President's recommendation and finally after weeks of heated discussion the law was repealed, but the financial situation was not relieved. The money stringency continued with the dread of tariff legislation hanging over the country. A tariff bill was enacted after months of debate which did not go to the lengths recommended by the President, and which he accordingly denounced as an act of perfidy and dishonor, although he refrained from vetoing it. The fight over the repeal of the Sherman Act and over the Wilson-Gorman Tariff Act disrupted the Democratic party and at the Congressional elections held in

1894 the Republican party came into control of both branches of Congress.

In 1896 the Republicans at Saint Louis, 16–18 June, nominated William McKinley for President and Garret A. Hobart, of New Jersey, for Vice-President, on a platform declaring for a protective tariff and for the maintenance of the gold standard. The Democratic convention at Chicago was carried away by the cry of free silver coinage at the ratio of 16 to 1. William J. Bryan, of Nebraska, and Arthur Sewall, of Maine, were nominated for President and Vice-President, respectively. The campaign was fought chiefly on the financial planks of the two platforms. McKinley and Hobart were elected by a decisive majority, both in the electoral college and of the popular vote. They received 271 electoral votes. Bryan and Sewall received 176 votes. Both Senate and House were strongly Republican in the 55th Congress. Thomas B. Reed was speaker of the House and Nelson Dingley, of Maine, was chairman of the Committee on Ways and Means. A special session of Congress was called to carry into effect the pledges of the party with regard to the tariff. The Dingley Tariff Act became law 24 July 1897. It marked the beginning of a period of prosperity unequaled in the previous history of the United States.

The disturbed conditions in Cuba growing out of the uprising against Spanish misgovernment were rapidly reaching a point where intervention by the United States would have become inevitable, when the destruction of the battleship *Maine* by a mine in Havana Harbor, on 15 Feb. 1898, roused the resentment of the people and precipitated the war with Spain. The war began on 21 April 1898. The American forces gained two great victories by sea, one in Manila Bay, on 1 May, the other off Santiago Harbor on 3 July 1898. After a brief and effective campaign by land, Spain sued for peace. The treaty of peace was signed at Paris on 10 Dec. 1898. It provided for the acquisition by the United States of the island of Porto Rico in the West Indies and of the Philippine Archipelago and the island of Guam in the Pacific. It placed the island of Cuba temporarily under the guardianship of the United States. The McKinley administration undertook the government of the newly-acquired territory with all the serious problems involved. It quickly set up a stable American government in Porto Rico. It established order in Cuba under a military administration, prepared the people of the island for self-government and on 20 May 1901 withdrew the American military forces, permitting the Cuban people to set up an independent republic of their own. In the Philippines, after four years of armed opposition by guerrilla tribes in Luzon, a civil government was finally established and the people of the island were given a degree of civil freedom such as they had not known in 400 years. Early in the McKinley administration resolutions were enacted providing for the voluntary annexation of Hawaii on terms similar to those contemplated by President Harrison in the treaty of annexation which President Cleveland withdrew. President McKinley was renominated at Philadelphia on 19–21 June 1900. Theodore Roosevelt was nominated by acclamation for Vice-President. William J. Bryan was again nominated for President at Kansas City on 4 July with Adlai E. Stevenson, of Illinois, for Vice-President. The Democrats reaffirmed the platform of 1896 with its declaration of free silver, but they declared the paramount issue to be the question of imperialism. The Republican candidates received 292 votes in the electoral college; the Democratic candidates 155 votes. The Republicans retained control of both Senate and House. On 6 Sept. 1901 President McKinley was shot at Buffalo by the anarchist Czolgosz. On 14 September he died. Vice-President Roosevelt succeeded to the Presidency. He pledged himself to carry out the McKinley policies under which the country had experienced unparalleled prosperity and he retained all members of President McKinley's Cabinet. Among the cabinet members thus retained in office was Elihu Root. As Secretary of War, Mr. Root effected a complete reorganization of the army on lines which made it capable of quick and effective expansion in time of need. He established the General Staff Corps. John Hay, as Secretary of State, enhanced the prestige of the United States throughout the world by his masterful handling of our foreign relations, securing the recognition of the «Open Door» in China and commanding respect for American diplomacy among the European powers.

The Panama Canal (q.v.), begun under Roosevelt and completed under the succeeding Republican administration, is one of the greatest engineering feats of all time and will have a lasting influence upon the development of the United States, bringing constantly into closer commercial and political relations the people of the Atlantic and Pacific coasts and simplifying the problems of national defense. It would have been indefinitely delayed had it not been for Roosevelt's firmness and prompt decision in dealing with the neighboring South and Central American states. The early years of his incumbency were marked by the settlement of the great anthracite coal strike, which threatened a coal famine in the winter of 1902. He brought the contending operators and operatives together and named a non-partisan commission composed of men representing labor, capital and the public, which named terms of agreement.

The Republican National Convention held at Chicago in June 1904 unanimously nominated Roosevelt as his own successor and named Charles W. Fairbanks, of Indiana, as the candidate for Vice-President. The Democrats at Saint Louis nominated for President Alton B. Parker, of New York, and for Vice-President Henry G. Davis, of West Virginia. Roosevelt and Fairbanks were elected, receiving a total of 336 electoral votes out of 476. In his second administration Roosevelt entered on a crusade against what he regarded as a dangerous tendency to concentrate power in the hands of capitalists controlling agencies of transportation, manufacture and commerce. He secured the enactment by Congress of legislation enlarging the functions of the Interstate Commerce Commission and investing the Commission with authority to fix railroad rates and abolish discriminating practices. The Department of Justice with his approval brought suit under the Sherman Law against large industrial organizations as combinations in restraint of trade.

In the spring of 1904 war broke out between Russia and Japan. After the battle of the Sea of Japan, 27 and 28 May 1904, in which the Russian fleet was almost annihilated, President Roosevelt (9 June) urged on the Russian and Japanese governments the desirability of putting an end to the war and proferred his good offices toward bringing about peace. Both governments acceded and appointed plenipotentiaries to discuss terms. Portsmouth, N. H., was selected as the place of meeting. A deadlock arising between the plenipotentiaries, the President again appealed to the high contracting parties and finally succeeded in bringing about an agreement. A treaty was signed at Portsmouth, 5 September. For his services in bringing about peace President Roosevelt was later awarded the Nobel Prize.

In November 1906 President Roosevelt made a visit to the Isthmus of Panama. This was the first time a President of the United States had gone outside the territorial limits of the Union, even technically. It was at a time when Congress was not in session and there were no great and immediately pressing questions which might call for official action by the President.

The first session of the 60th Congress passed an act to regulate the employment of child labor in the District of Columbia, intended to be a model law on the subject. It was the forerunner of more comprehensive legislation which was declared unconstitutional by the Supreme Court in 1918. On 30 May 1908 was passed an act to amend the national banking laws of the United States and creating a National Monetary Commission, which was authorized to investigate and ascertain what changes may be necessary in the banking and currency laws. This commission made an exhaustive and scientific study of our entire financial policy, which it had long been plain was faulty. Our banking system, based on legislation adopted early in the Civil War and applicable primarily to the Civil War emergency, was quite unequal to the demands of our expanding commerce. Our currency was inelastic. In times of monetary stringency the resources of the treasury were repeatedly called upon to meet a desperate emergency and even this reservoir of credit occasionally proved inadequate, as was evidenced in the panics of 1873, 1893, 1901 and 1907. The Monetary Commission composed of senators and representatives was fortunate in the high character of its personnel. At the head was Nelson W. Aldrich of Rhode Island, chairman of the Finance Committee of the Senate; while among the representatives on the commission were Edward B. Vreeland of New York, chairman of the House Committee on Banking and Currency, and John W. Weeks of Massachusetts, later a United States senator, a man of constructive ability and financial knowledge. Owing to limitation of time it was impossible to secure the enactment of a comprehensive measure such as Senator Aldrich and his associates had in mind, but a measure calculated to meet immediately urgent necessities and called the «Aldrich-Vreeland» Emergency Act was enacted. This act was first called into operation in 1914, after the outbreak of the European War, and by resorting to the methods of relief which it provided the danger of panic was averted. A striking feature of Roosevelt's administration was his dramatic action in sending around the world a great American fleet consisting of 16 battleships which stopped at many ports, impressing European and Asiatic powers with the potential naval strength of the United States. The fleet left Hampton Roads, Va., 16 Dec. 1907 and arrived at Hampton Roads, on its return, 22 Feb. 1909. The principal places visited were Trinidad, Rio de Janeiro, Valparaiso, Callao, San Diego, San Francisco, Honolulu, New Zealand, New South Wales, Australia, Manila, Japan, Ceylon, Suez, Naples, Villefranche, Athens, Algiers, Gibraltar and Portugal and everywhere the fleet was received with great demonstrations of goodwill toward the United States. While Roosevelt was President, the United States remained at peace. No foreign nation had the hardihood to trespass on the rights of American citizens on land or sea.

The Republican National Convention at Chicago in June 1908 named William H. Taft, of Ohio, for President and James S. Sherman, of New York, for Vice-President. The Democratic Convention at Denver, Colo., named William J. Bryan for President and John W. Kern, of Indiana, for Vice-President. Taft and Sherman were elected, receiving 321 electoral votes out of a total of 483.

President Taft, who had been a Federal judge, governor-general of the Philippines and later Secretary of War, was the personal choice of President Roosevelt for the succession, but he had hardly taken his seat before differences arose between the two. President Taft was lacking in political prescience. He showed a leaning toward the more conservative element of the party, called into his Cabinet men who were not in sympathy with the policies of his predecessor and asked for the resignation of men in high positions, in whom his predecessor had shown especial interest. A bitter contest grew out of the attitude of the Secretary of the Interior toward the program of the Roosevelt administration, which looked to the conservation of mineral and agricultural resources, especially in the West. This resulted in the displacement of Gifford Pinchot, the head of the Forestry Division, one of Colonel Roosevelt's closest friends. The Republican party in its platform in 1908 had declared for revision of the tariff and President Taft, on his own initiative during the campaign, had interpreted this to mean a «revision downward»— a declaration which was made much of later. Sereno E. Payne of New York, as chairman of the House Committee on Ways and Means, brought in a bill which was not regarded favorably by many members of the party, especially those from Western and Middle Western States, and when the Finance Committee of the Senate, under the leadership of Senator Aldrich of Rhode Island, undertook its amendment, reporting a bill to the Senate which Western senators thought drawn too closely in accordance with the necessities of textile manufacturers of the Northeast, it aroused bitter opposition and gave rise to one of the most acrimonious political debates which had taken place in the Senate in many years. The bitterness aroused by the contest had an influence on the future of the

United States which it would be hard to overestimate. It had much to do with the election of a Democratic House in 1910, with the election of a Democratic President in 1912 and with the Republican reverses which resulted in Democratic ascendancy during the years immediately preceding the war with Germany and the reshaping of the map of the world. The Payne-Aldrich Tariff Act was approved by President Taft 5 Aug. 1909; although he had severely criticized its provisions. Rates of duty were increased where found necessary or desirable, but were reduced in many instances. All prior commercial and reciprocity treaties were terminated, except the treaty with Cuba, and authority was given the President to create a board of experts to collect information upon cost of production of commodities at home and abroad. In opposition to public sentiment and against the judgment of Republican leaders, President Taft persisted in negotiating a reciprocity treaty with Canada. The agreement which contained provisions seriously affecting the agricultural and industrial welfare of the northern tier of Republican States was signed on 26 Jan. 1911. It passed the House on 14 Feb. 1911 under strong administration pressure but was not brought to a vote in the Senate before the expiration of the 61st Congress on 3 March 1911. A new bill was introduced at the special session of the new Congress which was called to meet on 4 April. Both House and Senate acted favorably on the bill, but Canada had seen new light in the meantime and failed to act. Thus reciprocity was defeated by the indifference of Canada after the administration had exhausted its influence in forcing it through a reluctant Congress. The proceeding accentuated the administration's unpopularity and helped to precipitate the split in the party.

The struggle in the House of Representatives between Speaker Cannon and the recognized organization on one side and a combination of Democrats and Republican insurgents on the other also contributed to the party's demoralization. Under the Reed rules the speaker appointed all committees and was himself chairman of the Committee on Rules which fixed the order of precedence for legislation, by the introduction of special rules, limiting debate and fixing the time for a vote, thus concentrating power in the hands of a small group of leaders. The insurgent Republicans with the aid of the Democrats, after a tumultuous time in the 61st Congress, adopted by a vote of 191 to 156 a resolution taking out of the speaker's hands the appointment of the Committee on Rules and making the committee elective. The 62d Congress made all committees elective and reduced the influence of the speakership below the point where Speaker Reed had found it. As the end of the administration approached it became clear that President Taft could not be reelected. He had not only alienated the Progressives in the party who regarded Colonel Roosevelt as their leader, but he had also alienated the substantial business element in the North and East by prosecution of suits under the Sherman Anti-Trust Law. Colonel Roosevelt had spent much time abroad during the early part of the administration, hunting big game in Africa, exploring in Brazil and visiting European and South American capitals. On his return the demand became vociferous in many quarters that he be a candidate against Taft for the nomination. Through delay in an announcement of his candidacy, however, many party leaders who might otherwise have favored it committed themselves to the renomination of Taft and when the announcement finally came it was accompanied by radical declarations for the recall of judges and judicial decisions and by other advanced ideas, antagonistic to the political convictions of many who had previously been among Colonel Roosevelt's most cordial supporters. The campaign for nomination was vituperative. The contending factions were not sparing in attacks upon each other's motives. The National Convention assembled at Chicago in June 1912 in the heat of passion, with many contested seats. After much wrangling the majority of these contests were determined in favor of delegates pledged to Taft in accordance with recognized rules and precedents which had governed previous conventions. Taft and Sherman were renominated. The followers of Roosevelt, denouncing the action of the convention as illegal and declaring that the nomination had been stolen, withdrew before the ballot was taken, organized a new party and called a convention of their own. This convention of Progressive Republicans met at Chicago in July, nominated Roosevelt for President by acclamation and named Hiram W. Johnson, governor of California, as his running mate. The Democratic Convention at Baltimore in June nominated for President Woodrow Wilson, of New Jersey, and for Vice-President, Thomas R. Marshall, of Indiana. In the election Taft carried only two States, Vermont and Utah, with eight electoral votes. Roosevelt received 88 electoral votes and Wilson received 435 electoral votes. The Congress chosen was Democratic in both branches. Vice-President Sherman died before the meeting of the electoral college and the votes of Vermont and Utah were thrown for Nicholas Murray Butler of New York. With the inauguration of Wilson and Marshall on 4 March 1913 the Republican party went out of power in all departments of the government and remained in a minority in all departments until 4 March 1919 when they regained control of the Senate and the House of Representatives — the Senate by a majority of two, the House by a majority of 45.

Although in a minority and excluded from participation in administration councils, the Republican leaders in Congress and out were able to modify to some extent radical and dangerous tendencies in legislation, to neutralize the errors of the majority and to perfect measures which had possibilities of merit. The Federal Reserve Act of 23 Dec. 1913 as enacted carried into effect many of the changes in our banking system recommended by the Monetary Commission, and in its final form it had the benefit of the knowledge and experience of Senator Weeks, who at that time was the recognized Republican authority in the Senate on financial questions. The amendments which he induced the Senate to incorporate in the original bill framed by the administration and forced through the House, were of incalculable value in eliminating provisions which contained the germs of currency inflation and future panics.

The Underwood Tariff Act was an expression of classic Democratic theories — a tariff for revenue, not protection. It brought on industrial doubt and depression, arrested manufacturing production and led to unemployment and distress all through the industrial North. The outbreak of war in Europe nullified the evils of the act, since the peaceful and exporting industrial energies of Europe were transferred to the industries of war and destruction and gave to neutral America an artificial but highly profitable market for all her products and stopped the western flow of competitive products.

The plainly-announced purposes of the Wilson administration and its intolerance of advice and criticism had one wholesome political effect — it made a solid and united party of all Republican factions. The National Convention of June 1916, at Chicago, nominated for President former Gov. Charles E. Hughes, then on the Supreme Court bench, and for Vice-President, Charles W. Fairbanks. The Democratic National Convention at Saint Louis, a week later, renominated Wilson and Marshall. For over three years the American people had been fed on the strange doctrines of pacifism, internationalism and socialism. While Europe was at war, we were at peace, and through the very fact of war abroad were rich and prosperous at home. At the same time we were earning the contempt and ill-will of all the warring nations. American citizens had suffered much in Mexico, while the government pursued its policy of «watchful waiting,» and now were slaughtered on the high seas without any vigorous or effective steps being taken to protect American interests. Republican leaders, like Roosevelt, Lodge and Weeks, and military leaders like Gen. Leonard Wood, saw that we might at any time be dragged into war in order to maintain our national self-respect, and urged insistently that we put ourselves in readiness, but the administration, preaching neutrality and neglecting even ordinary preparations, went to the country with the boast that Wilson had «kept us out of war» and carried the election by a narrow margin of the popular vote in States which were affected by this cry. The Wilson administration had undivided responsibility and unlimited power from the time war was declared — modified only by constructive criticism by the Senate of inefficient and extravagant control of war activities, and when the Congressional elections of 1918 were at hand, the President issued an appeal to the electorate to return a Democratic Senate and House because «the leaders of the minority in the present Congress have unquestionably been pro-war but they have been anti-administration»; because «unity of government is as necessary now in civil actions as it is upon the field of battle,» and because «the return of a Republican majority to either House of the Congress would moreover be interpretative on the other side of the water as a repudiation of my leadership.» The response of the country was emphatic and unmistakable. The Congress elected was Republican in both branches, and the President within a month after the election set sail for Europe to appear there in the Peace Conference as the spokesman of American opinion and purpose.

The Republican party from its beginning has been distinctly an American party, a party of constructive ability and of moral purpose. In power it has been rich in achievement and in a minority it has been unselfishly loyal to the best interests of the United States. The war with Germany is the first war since the United States became a nation in which the party out of power has stood unswervingly for the successful prosecution of the war and by its attitude has forced the party in control to greater efforts than those in power would have preferred. The most compact and forceful summary of its principles to-day was set forth in the Middlesex Resolutions accepted by the Republicans of Massachusetts just before the signing of the armistice which marked the end of the great European War. This is the creed:

> To carry on the war unflinchingly to unconditional surrender.
>
> Germany to make full reparation for her crime against the world.
>
> A lasting peace which leaves America the master of her destiny — a nation unbeguiled by international or socialistic dreams.
>
> Revitalize the Hague tribunal. Create machinery to insure observance of its awards.
>
> Political and economical independence for the United States.
>
> The Monroe doctrine to be respected and enforced.
>
> No foreign power to have the right to meddle in American affairs.
>
> No European interference in Cuba, Mexico, the Caribbean or the Philippines.
>
> The Panama canal to be owned, controlled and fortified by the United States.
>
> A navy strong enough to guard our commerce and our coast.
>
> A strong army to repel invasion and resist aggression.
>
> Universal military training that we may always be prepared for national defense.
>
> Protection of American industry. No agreements with any other nations preventing the enactment of such tariff laws as we see fit.
>
> Internal taxes an incident to revenue and not its chief reliance. No excessive and unequal burdens of taxation upon any section, industry or class.
>
> A great merchant marine.
>
> Congress to begin at once to solve tremendous problems soon to be upon us. We who were criminally unprepared for war must not be unprepared for peace.
>
> When war is done, to lose no time in bringing home the men who have been fighting overseas.
>
> To stop the insidious growth of bureaucratic government and put an end to the petty tyranny of manifold commissions.
>
> No government ownership except of undisputed government activities.
>
> To restore freedom of speech and of the press.
>
> To reassert the constitutional prerogative of Congress that this may once more be a government of laws and not of men. Having fought to rid the world of Prussianism, let us not Prussianize ourselves.

This platform, promulgated before the armistice with Germany became effective on 11 Nov. 1918 not only anticipated the termination of diplomatic negotiations in the settlement of terms of peace but also defined the party's attitude on foreign and domestic problems which speedily pressed for solution. After the conclusion of the armistice with Germany, President Wilson hastened to Europe to conduct in person the negotiations for peace on behalf of the United States. He remained abroad until the end of February 1919 returning for a few days in order to sign the bills passed by Congress in the closing days of its session; he then returned to France and remained abroad until July, when he brought back with him the treaty with Germany, which he and the representatives of other powers had signed, including the covenant of a League of Nations, the ostensible object of which was to create an organization through which the permanent peace of the world might be secured. The Senate, deprived of the usual sources of information with regard to the details of the treaty of peace, undertook to consider that great question with the aid of such inquiries as it could institute on its own initiative. The majority of the Republicans in the Senate believed that the treaty as signed, including the covenant of the League of Nations, failed to protect American interests and imperilled recognized American doctrines. The division in the Senate and in the country was not strictly on party lines. Some Democratic leaders were equally insistent with the majority of Republicans in their determination to Americanize the treaty and so amend the covenant of the League of Nations that it should not endanger national interests. As the inquiry in the Senate proceeded, the debate became nation-wide and the feeling throughout the country strengthened that in the parleys at Paris, American delegates had entered into engagements to which the Senate could not assent without betraying the United States. There was an insistent demand that the treaty be rejected altogether and that the Congress by resolution declare a state of peace. So strong did this feeling grow that on 4 September the President began a tour of the country in order to save his work at Paris from defeat.

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**REPUBLICAN PARTY, Jeffersonian,** the name of the party of which Thomas Jefferson was leader. During Washington's first administration the Federalist party showed a tendency to centralize the government and to destroy little by little the rights of the States. The Federalist leader at that time was Alexander Hamilton, and Thomas Jefferson was the ablest among the opponents of the Federals. The differences between the two led to the resignation of Jefferson from Washington's cabinet on 31 Dec. In the election of 1796 Jefferson was the candidate of the Republicans, but was defeated by John Adams, the Federalist candidate. Under the law as it then existed Jefferson became vice-president. He watched carefully the march of events and when the Federalists, who were almost monarchists at heart, passed the hateful Alien and Sedition Laws, Jefferson and Madison prepared and secured the passage of the Kentucky and Virginia resolutions. The reaction against the Federalists set in at once. Jefferson was the candidate of the Republicans in 1800 and received an equal number of votes with Aaron Burr and it devolved upon the House of Representatives to make one of the two president. The Federals thought to prevent an election, but calmer counsels prevailed and, Hamilton throwing his weight to Jefferson, the latter became President. His first administration was marked by great simplicity and by a great reduction in expenditure. See JEFFERSON, THOMAS.

**REPUBLICS, Duration of.** It is not easy to set down in each case precisely the length of years that the various republics have existed. Among historians there are differences, in most instances, as to the dates of beginning and ending. Some authorities date from the physical overthrow of a monarchy or other form of government preceding; others from the beginning of the struggle for popular rights; others from the adoption of a constitution, and so on. Some accept as the end the accession of king or emperor, or the actual establishment of a new form of authority, while others hold that the republic really became nonexistent before those events occurred to finally and formally mark its disappearance. Frequently the birth or the death of a republic has been a gradual development extending over many years, so that it is almost impossible to fix the exact time when it was fully fledged.

or, on the other hand, had passed away completely. Some republics, noticeably those of South America and Central America, have had interrupted careers, republican rule in them being frequently suspended for a few months or even years, while dictators have held power, although in form, at least, it has been practically continuous. Others have begun as members of a republican federation and later have been established entirely independent. Venezuela, Colombia and Ecuador were originally united in the one republic of Colombia; Guatemala, Honduras, Nicaragua and San Salvador were first members of a federal union. It is a disputed question whether such republics should be considered as dating from the beginning of the federation or from the beginning of their individual independence. In the appended table the former view is generally taken; approximately, then, the duration of life of the world's republics is as follows:

| | | |
|---|---|---|
| Israelitish Commonwealth | 1491–1095 B.C. | 396 years. |
| Grecian republic | 700–146 B.C. | 554 years. |
| Carthage | 850–146 B.C. | 704 years. |
| Rome | 535–29 B.C. | 506 years. |
| Lombard Communes | 1183–1530 | 347 years. |
| Genoa | 1000–1802 | 802 years. |
| Venice | 600–1796 | 1196 years. |
| Amalfi | 900–1135 | 235 years. |
| Free Cities of Germany | 1241–1630 | 389 years. |
| Hamburg | 1630– | |
| Lubeck | 1630– | |
| Bremen | 1630– | |
| Frankfort | 1630–1810 | 180 years |
| Iceland | 928–1261 | 333 years. |
| The Netherlands | 1609–1805 | 196 years. |
| French Republic I | 1792–1804 | 12 years. |
| French Republic II | 1848–1852 | 4 years. |
| French Republic III | 1871– | |
| San Marino | 885– | |
| Andorra | 790– | |
| Switzerland | 1291– | |
| Liberia | 1820– | |
| Orange Free State | 1854– | |
| South African Republic | 1849–1903 | 54 years. |
| United States of America | 1776– | |
| Mexico | 1824– | |
| Venezuela | 1819– | |
| Colombia | 1819– | |
| Ecuador | 1819– | |
| Peru | 1821– | |
| Bolivia | 1825– | |
| Paraguay | 1811– | |
| Argentine | 1810– | |
| Uruguay | 1825– | |
| Chile | 1810– | |
| Guatemala | 1823– | |
| Honduras | 1823– | |
| Nicaragua | 1823– | |
| San Salvador | 1823– | |
| Costa Rica | 1821– | |
| Brazil | 1889– | |
| Haiti | 1804– | |
| San Domingo | 1844– | |
| Cuba | 1903– | |
| Hawaii | 1894– | |
| Panama | 1903– | |
| Portugal | 1911– | |
| China | 1911– | |
| Russia | 1917– | |
| Austria | 1918– | |
| Poland | 1918– | |
| Czecho Slovakia | 1918– | |
| Esthonia | 1918– | |
| Latvia | 1918– | |
| Finland | 1918– | |

Of these 54 republics 33 were in existence in 1912. No dynasties can compare in years of existence with the 12 centuries of Venice, the 11 centuries of Andorra and the 10 centuries of San Marino. Few can show longer life than the republics of Israel, Carthage, Greece, Rome, Genoa, Switzerland and the Hanse cities of Germany. The ancient republics of Greece, Carthage, Rome, Lombardy, Venice and Genoa were the greatest nations of their times. In art, literature, law, commerce — all that goes to make up the best of modern civilization, they led the world for more than 1,000 years, and left a heritage of good for all mankind coming after them, such as can be credited to no monarchy. The death of those that have gone out of existence was not, as is claimed by some, due to defects peculiar to the republican form of government. It came about naturally from the condition of things in the civilization of the earlier centuries. Men were warlike in those days, unrestrainedly contentious and regardless of the rights of others; public and private affairs were in the hands of the turbulent; class distinctions were sharply defined. Under such conditions all governments were, for the most part, short lived. Monarchies and oligarchies suffered as well as others. One after another they rose and disappeared, and none of them, until comparatively recent centuries, endured as long as the republics that were contemporary with them or that succeeded. The older republics deteriorated in public spirit toward the end; they were torn by internal dissensions; they became the prey of extravagance, dissolution and idle wealth within their borders, while jealous neighbors constantly sought to plunder and destroy or subjugate them. But these were dominant evils of the day in all lands and it stands to the credit of republican institutions that, despite disintegrating forces constantly at work, they existed long and splendidly. In modern times the story has been much the same. Only Great Britain and two or three smaller monarchies can show results comparable with contemporary republics, and in those countries constitutions have given the people almost as much voice in public affairs as in a republic. Even in South America and Central America, where government is still more or less chaotic and uncertain, the republics are an improvement upon the despotic rule of Spain which they succeeded. The first French republic was undisguised anarchy; the second was merely in comparison a temporary flurry, but the third suffered in no wise in comparison with the most brilliant decades of the French kingdom or empire. The United States of America, under republican form of government, in all that goes to make up a great nation, has advanced to the forefront of world powers. Brazil has been as well governed throughout the period of its republican existence as it was even under the last Dom Pedro, most beneficent and most democratic of monarchs. The lesson to be drawn from the history of these republics is that men are able to govern themselves well. The dangers and evils that may threaten the republic have always been and are now the dangers and the evils inherent to the period, and threatening to any government, republican or otherwise. The elasticity of republicanism, permitting of easier adaptation to changing conditions and readier conformity to the needs of the people, gives it an advantage over the more rigid monarchy. That the general trend of the 19th century was toward republicanism cannot be questioned. Nearly half the republics that history tells of were started then and all of them are now in existence. At the beginning of the 20th century more than one-half of the territory that is included in the civilized world belonged to republics and fully one-third of the population in all the civilized countries lived under republican rule. See REPUBLIC; REPUBLICS, THE HISTORY OF.

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**REPUBLICS, The History of.** The word republic is derived from the Latin *res,* a thing, and *publicus,* belonging to the people. The word is frequently applied to any group of individuals having a common interest in their pursuits, as the republic of letters. Its general usage, however, is as a political designation for a state or country in which the supreme power of government is vested in rulers elected periodically by those of its citizens who have acquired the right to vote. In the narrowest sense a republic is a democracy where political power rests in all the people and is wholly in their unrestricted control. It is the antithesis of a monarchy, where the power rests in one individual or family and is self-perpetuating through dynastic succession. Between these two extremes of monarchic and democratic government are other forms, of oligarchic or aristocratic character, where the right of participation in the direction of public affairs is in the hands of classes or of a restricted portion of the community. Strictly speaking, these are not republics, but in history nearly all authorities agree in so regarding and placing them.

Republics may be divided into two distinct types, the centralized and the non-centralized. A centralized republic is one in which all power is deputed to and is exercised by the general government entirely independent of local authority in any of the subdivisions of the country. France and some of the South American republics are examples of the centralized republic. When the power of the general government is derived, to a greater or less extent, from the local constituent bodies or states which also have independent rights and powers over which the general government has no constitutional control, we have the non-centralized republic. The Greek republics, the free cities of Germany and the United States of America are examples of the non-centralized republic.

**The Earliest Republics.**— In prehistoric times when men first began to feel the necessity for communal control of their affairs and interrelations, government took somewhat the form that has persisted in modern times in the monarchy. At the beginning this was patriarchal, as history shows us at later date among the Hebrews, the Pelasgians and other early races. The head of the family was recognized as supreme in authority, first over his immediate family and then over its branches. As the associated families grew in number and size and expanded into tribes, the strongest family or group of families asserted its pre-eminence by force or peacefully, by common consent, and became the ruling power; hence the king and the dynasty. It was a reversion from this condition that led to the earliest republics of which history has anything to tell. Among the Israelites, the patriarchial or family government continued until the time of the Egyptian serfdom. When, under Moses, the people escaped from Egypt and became again free and independent, the Israelitish commonwealth or republic was established; it lasted nearly four centuries, from 1491 B.C. to 1095 B.C. Under Moses and Joshua the government was of the consolidated and centralized type. All the people, young and old, rich and poor, male and female, had a voice in public affairs and the privilege of political preferment. This is the earliest record of choosing rulers by elective franchise. Only the priesthood was a privileged class. Laws were beneficent and wise; a general system of education was established; the military spirit was fostered so that the nation became a strong power. Usury was illegal and interest was regarded with disfavor. An agrarian law assigned to each family a small acreage of land and this was made inalienable; it could not be held under mortgage or sale. Of this early stage of the republic it has been said that «the descendants of Abraham had reached a higher state of virtue and happiness than any other nation of that period.» Upon the death of Joshua the seeds of disintegration were sown. The different states seceded, forming independent confederacies, although generally all were united for common defense. Dissensions arose, patriotism weakened, officials became dishonest and finally the people, whose will was still the highest law of the land, demanded of Samuel a king. Saul was anointed king in 1095 B.C. and that was the end of the Israelitish republic.

**Greece.**— In the Heroic Age, Greece was divided into several states or tribes, each ruled by a chief or king. It was about the time of the first Olympiad — 776 B.C.–772 B.C.— that the people began to aspire to political independence, and they gradually deposed the kings, setting up chosen rulers in place thereof. At first the new governments were oligarchal, but in the course of time all of them, except that of Sparta, became democratic. The states were only loosely bound to each other and national unity was altogether lacking. Athens became foremost in the time of Thucydides and exercised a sort of sovereignty over the entire country. But after a while Sparta imposed her oligarchic system upon the other states and then again Thebes had the ascendancy. Greek civilization, Greek laws, Greek art, Greek literature, Greek patriotism, became forces that have never ceased to dominate the world. But the passion for wealth and display, local political strife and particularly jealousy between the different states and cities led to dissension and disunion. Greece came under the influence of the Persian monarchs, then was ruled by the Macedonian kings, Philip and Alexander, and finally, when in 146 B.C. the Roman legions conquered Macedonia, the last Grecian league, the Achæan, and then Athens, were completely vanquished. Successively under the domination of Roman Empire of the East, the Byzantine Empire and Turkey, Greece, finally reunited, became an independent kingdom, under a constitutional monarchy in 1832.

**Carthage.**— Carthage had its beginning before history had its records. Five centuries before Christ it flourished under rulers who were not hereditary, but who were elected by the people. The commonwealth of Carthage was a centralized republic, unlike that of Greece and similar to that of Rome. In the Great Council of the State and in the Council of the Elders there was something of aristocracy, but on the whole the people were in control. There was a liberal administration in the interest of all citizens alike, courts of justice, banking institutions, public libraries and schools of literature and art. Carthage acquired great wealth and a high degree of civilization. Her territory was wide, extended and rich, and the city, Carthage, capital of the country, was the most superb of that day, being to the republic what Paris is to France. The prosperity of the commonwealth begat its downfall. Political feuds developed and its citizens became divided into factions. Rome, grown in power, saw the opportunity for revenge for earlier defeats and humiliations. Her legions swept over the country. Carthage, the splendid city, was blotted from the face of the earth, never to reappear, and with her went every vestige of the republic of which she was the metropolis.

**Rome.**— Like Israel and Greece, Rome had its political beginning in peoples who were organized in families, clans and tribes. In the early Roman state a king was the ruler, partly an hereditary chief and partly an elected magistrate. Naturally the kingly office grew in importance and power until, in the time of the Tarquins, it was well-nigh supreme. Still even during this regal period the people retained much power. The inhabitants were divided into two classes, patricians and clients, and the franchise and right of office-holding were possessed only by the former. A similar condition existed under the Etruscan kings, who ruled from the 7th century before Christ. With the deposition of Tarquin, the Proud, at the close of the 6th century before Christ, the Roman republic began and lasted until 27 B.C., nearly five centuries. Of the early years of the republic little is positively known. Romance and tradition make up a large part of the story. In order to curb the growing power of the executive office, administrative authority was vested in two elected consuls, with limited tenure of office; but as had always been, the franchise still remained in the patrician class to the exclusion of the plebeians. No sooner was the republic fully established than a struggle for power began between the two classes and lasted for several centuries. The patricians endeavored to establish an exclusive aristocratic government on the ruins of the monarchy, and the plebeians demanded a large participation in common civic privileges. Slowly but surely the plebeians gained. Gradually the social and political barriers between the classes were broken down and by the 3d century before Christ practically all distinctions in regard to the franchise and office holding had disappeared. In 200 years the Romans emancipated themselves, first from kingly and then from oligarchal domination. During these and the ensuing centuries constitutional changes were frequent, but until toward the end, generally to the enlargement of the powers of the people. Under this republican government Rome arose to a civic distinction unparalleled at that time. The story of the city and state fills the most brilliant pages of ancient history. Her law is to-day largely the basis of law throughout the civilized world. She made herself mistress of the peninsula of Italy and then conquered the world. Her power became colossal and then her conquests proved her undoing. War made her a military nation and agriculture was neglected. The spoils of victory brought to her enormous wealth and created great fortunes for her soldiers. Inordinate extravagances followed and resultantly the condition of the poorer classes became more and more distressing. Reverence for law disappeared, many attempts were made by the aristocracy to control the power of the masses and the state became an arena on which men were merely contending for power, wealth and influence. The civil war in which Marius and Sulla were the leaders was the final struggle between the aristocratic and democratic elements. Constitutional government had been long forgotten and, in the general distress, all classes of citizens felt that a change of government with a strong man at the head was the only thing that could save the state. So Sulla was proclaimed dictator in 81 B.C. In form the republic endured for 50 years more under the consulships of Pompey, Cæsar, Crassus and Cicero, but it was little more than form. The dictatorship of Cæsar in 48 B.C. was another step toward the end, and Rome was ready for the empire when Octavius Augustus came to the head of the state and was proclaimed imperator in 33 B.C. Republican institutions more and more faded into the background during the life of Augustus and in all but name he was an absolute monarch. When Tiberius succeeded to the throne, Rome was an empire in reality.

**Mediæval Republics.**— In mediæval times there were the Lombard communes, the independent cities of Italy, the free cities of Germany and Iceland, all of which had republican forms of government. Lombardy, in the north of Italy, was a separate kingdom, part of the Carolingian Empire, or annexed to the German Empire until near the close of the 10th century. Then arose a number of independent duchies, as Mantua, Susa, Piedmont and others and several independent cities that in the 11th century became republics. Among these were Florence, Milan, Padua, Piacenza, Treviso, Modena, Cremona, Vicenza and Bologna. In them municipal organization grew up independent of Church or empire that had heretofore dominated. Consuls were elected by the citizens and arts, crafts and guilds had part in the control of affairs. Between these cities there was no firm federal compact, but in times of danger they formed powerful leagues for mutual defense. Although they grew in wealth, power and influence their governments were never stable. They quarreled with each other and were torn by internal dissensions, constantly shifting between the power of the people and the power of the few. The history of Florence, which remained longest the champion of constitutional liberty, is a story of centuries of contention between the forces of democracy and oligarchy. One by one these cities finally fell before the assaults of foes, were incorporated into kingdoms, duchies or principalities, becoming, in some instances, possessions of Austria and finally were incorporated into the kingdom of Italy. In the 10th century Genoa established a free constitution. During the next two centuries the republic increased in wealth and power. A world-wide commerce was established and many of the large cities of southern Europe and Asia came under her control, as Marseilles, Nice, Venice and Constantinople. At the outset the constitution of the state leaned toward an aristocracy. A bitter antagonism between conservatism and democracy developed, changes of government became frequent and in 1339 the citizens elected a doge for life. Three centuries later Genoa yielded to Austria and then to France, by the Treaty of Vienna became a tributary city of the Sardinian monarchy and ultimately a part of the Italian kingdom. Venice had an independent government in the middle of the 6th century, her rulers being called military tribunes. From 697 to 755 the elected chief magistrate was the doge, whose authority was well-nigh imperial. Universal suffrage existed, but during the season of the republic's greatest prosperity, wealth and aristocracy for the most part administered public affairs. In time the democracy demanded more rights and privileges and in the 11th and 12th centuries the strife between the aristocracy and the commonalty was determined and bitter. In 1172 the government became essentially a patrician oligarchy with constantly increasing power, and in 1298 popular elections were abolished by the Great Council. Further encroachments upon the civic rights of the people, expensive wars with sister republics and selfish legislation of the oligarchy undermined patriotism, and for four centuries the classes fought with each other. In 1674 the oligarchy yielded to the commonalty and for another century the republic continued in varying fortune until Napoleon, in 1797, placed it under the domination of Austria. Amalfi, on the west coast of southern Italy, was an independent city of 50,000 inhabitants in the 9th century and the capital of a flourishing republic. Toward the close of the 11th century Amalfi was subjugated by the Normans.

**Later Struggles.**— The larger towns and communities of northwestern Europe gradually freed themselves from the exactions of feudal lords and became independent. From the beginning of the 12th century they established a large commercial intercourse between themselves and with the rest of the world. To protect themselves against marauders and to develop their commercial interests they formed the Hanseatic League in the 13th century. Hamburg, Lubeck, Bremen, Frankfort and Cologne were the principal cities in this league, but city after city joined the union until it embraced 85, and in power matched the strongest governments of Europe. These cities were sovereign states and, while part of the German confederation or empire, they exercised full authority in their local affairs. In the Hanse confederacy they held the Baltic in dominion and controlled the foreign commerce of northern Europe. The league lasted until 1630, although previous to that date it had been shorn of its powers. Most of the cities had been absorbed into the German kingdoms or principalities and at last only Hamburg, Lubeck, Bremen and Frankfort remained independent. In 1813 these four became free members of the German Confederacy, but in 1866 Frankfort fell to Prussia. Hamburg, Lubeck and Bremen still retain their freedom in local affairs, being governed by chambers of representatives elected by popular vote.

Iceland was settled by exiles from the tyranny of the princes of Norway, Denmark and Scotland, in the 10th century and a republican form of government was established in 928. At the head was placed a supreme magistrate, elected by the people and sharing authority with a general assembly. This form of government lasted for nearly 400 years and Iceland attained to civilization and a measure of prosperity. But internal dissensions sprang up and civil wars devastated the island. In 1621 the National Council, by common consent of the people, invited Haco, king of Norway, to become Iceland's ruler and in 1380, again by common consent and peacefully, the island was transferred to Denmark.

During the 10th, 11th, 12th and 13th centuries Belgium and Bavaria were split up into small dominions. In 1383 the house of Burgundy obtained control of this territory, which afterward became the 17 provinces of the Netherlands. Following the Burgundian rule came the long struggle with Spain, which ended in 1648 with the Peace of Westphalia, by which the independence of the republic of the United Provinces was acknowledged by the great powers of Europe. The provinces had formally united, with William of Orange as stadtholder, in 1580. The republic continued through many vicissitudes for two centuries, the people enjoying political freedom and the nation acquiring a high degree of power and prosperity. European politics could not withhold its hand from the Netherlands, and the Dutch provinces were in constant turmoil within and engaged in war without. In 1747, through all these influences, William IV was made captain and admiral-general of the whole union and stadtholder of the seven provinces; a little later these offices were made hereditary in both male and female lines. At the time of the French Revolution the stadtholder was driven out by the French and the old republican forms of government re-established; but in 1814 the people recalled the Prince of Orange from his exile in England and established the monarchy, under William I, king of the Netherlands.

**France.**— The first French republic had an inglorious career of 12 years. It began with the overthrow of the monarchy in 1792 and ended with the crowning of Napoleon as emperor of France, in 1804. The 12 years of this republic were 12 years of terror. A state of anarchy existed, not a state of government. It was a despotism of a democratic mob united with the despotism of a democratic dictatorship. When the passion of the hour had burned itself out and Robespierre, Marat, Danton and other leaders had fallen, France turned again to a monarchy for self-preservation. For the second time the people, in 1848, overthrew the monarchy and re-established a republic. The king, Louis Phillippe, abdicated and fled to England and a new constitution was adopted, providing for a President, a council of state and an assembly elected by popular vote. Louis Bonaparte was elected the first President and in 1852 by an almost unanimous vote he was accepted as hereditary emperor under the name of Napoleon III. The second empire lasted for 18 years and was succeeded by the third republic in 1870, which was in stable and unthreatened existence in 1918. The defeat of France by Germany in 1870 led to the overthrow of Napoleon III and the Napoleonic dynasty. For almost half a century France, the republic, has steadily grown in wealth and power, and is reckoned as one of the strongest nations of Europe. Its government is a pure democracy and authority is vested in a President elected for seven years, by the Congress and a Senate and Chamber of Deputies elected by the people, the latter by popular vote and the former by an electoral body.

**Switzerland.**— The Swiss republic dates from 1291, when the men of Uri, Schwyz and Unterwalden entered into a defensive league. Other cantons were added to the league until, in 1798, under the influence of France, the Helvetic Republic was formed with a regular constitution. In 1815 the perpetual neutrality of Switzerland and the inviolability of her territory was guaranteed by the powers of Europe. The republic is non-centralized, each canton having independent local powers. The federal government consists of a state council of members elected by the separate cantons and a national council elected by the people as a whole. The President and the Vice-President are elected for terms of one year by the federal assembly. Universal suffrage prevails and the compulsory referendum and popular initiative are features of legislative procedure.

**Andorra.**—Andorra, in a valley of the eastern Pyrennees, between France and Spain, is under the joint-suzerainty of these two countries. It was declared a free state by Charlemagne and has always retained its independence. It is governed by a council of 24, elected by the people, and the chief executive is a member of the council, elected for life by his associates. It has a population of less than 10,000.

**San Marino.**— San Marino, in Italy, is the oldest existing republic in the world. It embraces five villages with a population of about 11,000. The general government is entrusted to a council of 60, the chief officer being termed captain-regent.

**The United States.**— On the western hemisphere, with the exception of the Dominion of Canada and the smaller dependencies of Great Britain, France and Holland, every country is under a republican form of government. The United States of America is the oldest of these republics, the most extensive in territory and the largest in population. It stands among the world's greatest powers and in its influence it dominates the Western world. As a nation, the United States originated in the colonies of Great Britain that existed in the eastern, middle and southern sections of the New World in the 18th century. The inhabitants of these colonies were mostly of English origin but they rebelled against the rule of the mother country and united in establishing themselves as a free nation, under the Declaration of Independence in 1776. In form of government, the country is a non-centralized republic, and its constitution and form of government have been the pattern upon which all republics have been modeled since the beginning. The President, who serves for a term of four years, is chosen by an electoral college, the members of which are elected by popular vote in the several States and represent the State-at-large and its Congressional districts. The Senate consists of two members from each State, elected by popular vote. The House of Representatives consists of members elected by popular vote in the separate Congressional districts in the several States. There is a Federal judiciary and, in foreign relations, interstate commerce, army and navy affairs, navigation and postal service, the Federal government is supreme. Each State is wholly independent in the control of its own affairs, having a form of government like the Federal, a governor, upper and lower houses of legislation and State judiciary. The nation has had a prosperous existence. It has been engaged in wars with England, France, Mexico and Spain and passed through, 1861–65, the greatest Civil War the world has ever known. It has expanded until now it covers the northern part of the hemisphere from the Atlantic to the Pacific and from Canada on the north to Mexico on the south. At a result of the Spanish-American War, the republic entered upon a colonial policy and extended its operations across the Pacific. It acquired the Philippine Islands by the treaty of 1898 and also the islands of Porto Rico and Guam, and all three have been held as colonial dependencies. Hawaii, whose white citizens had revolted from native monarchial rule and set up an independent republic, was annexed to the United States in 1898 as a Territory. For centuries the island of Cuba was under the rule of Spain. Insurrection followed insurrection against the Spanish power, but Cuba was held fast as a Spanish colony until the Spanish-American War, of which it was the cause. In the peace treaty between the United States and Spain, Cuba was relinquished. It was temporarily held by the United States pending the establishment of a stable home government, but in 1901 this was accomplished and in the following year, with Tomas Estrada Palma at its head, free Cuba took its place as the latest republic in the world. Universal suffrage with educational qualifications prevails, and the form of federal government and methods of election follow closely those of the United States of America. In 1917 and 1918 the United States was engaged in a stupendous war against the central allied powers of Germany, Austria and Turkey. In this she was one of the allies of England, France, Italy, Belgium and other allied nations fighting to sustain the cause of democracy. See WAR, EUROPEAN.

**South America.**— The South American republics are 10 in number, Argentine, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay and Venezuela. Early in the 16th century Spain invaded and subjugated Peru and achieved a conquest of almost the entire South American continent. For three centuries she was able to master and hold not only that portion of the hemisphere, but also the territories of Mexico and Central America and a great part of what is now the western and southwestern section of the United States. In South America she divided power only with Portugal. In the first quarter of the 19th century most of the South American states achieved their independence and established themselves under republican forms of government. The agitation for emancipation broke out almost simultaneously in different parts of the continent but was not always quickly or easily successful. In 1810 the Chileans revolted against the king of Spain and a junta which met at Santiago elected the Marquis de la Plate, a native Chilean, President of the republic, but it was not until 1818 that independence was formally proclaimed. A constitution was voted in 1833. The Argentine provinces freed themselves from the Spanish yoke in 1810, but were immediately embroiled in disputes and contentions among themselves. The history of the republic until comparatively recently was a record of anarchy, civil contentions and warfare with European nations and sister republics. The existing constitution was adopted in 1853. Paraguay gained its independence in 1811 and after a short period of government by two councils, the supreme power was seized in 1815 by Dr. José Gaspár Rodriguez Francia, who exercised autocratic sway as dictator until his death in 1840. A state of anarchy followed and lasted two years, after which a National Congress put two consuls at the head of affairs. The dictatorship of President López followed, and in 1870 a new constitution was voted, making the country a full-fledged republic. Bolivar, the liberator, began his work for freeing South America from the Spanish yoke in 1809. After alternate defeat and success, he finally triumphed, and in 1819 united New Granada and Venezuela as a republic under the name of Colombia. In 1832 the republic split up into Venezuela, Ecuador and New Granada, and after several changes in constitution and in state membership, the country became, in 1886, the republic of Colombia. In 1820 San Martin, at the head of an invading army from the republic of Chile, entered Peru, drove out the Spanish authorities and proclaimed himself protector. Two years later Simon Bolivar, at the request of San Martin, entered the country and was appointed dictator. Under Bolivar, Peru achieved her full freedom. A succession of civil wars and constitutional changes followed during a period of over 30 years. A constitution, in the modern spirit, was proclaimed in 1856 and under it the republic has continued since. In 1825 the republic of Bolivar was instituted from the southern province of Peru by Simon Bolivar and named after its founder. The constitution then formed underwent important modifications in 1828, 1831, 1863 and 1880. For nearly two centuries the territory of Uruguay was the subject of almost constant contention between Brazil and Buenos Aires. In 1828 by the mediation of England, the northern part of the territory was ceded to Brazil and the southern part was erected into the republic of Uruguay, having declared its independence three years before. The constitution was established in 1830. The republic of Ecuador was established in 1830 as the outcome of a civil war which separated the members of the original republic of Colombia formed by Simon Bolivar upon the ruins of the Spanish kingdom of New Granada. Its constitution was voted in 1844 and modified in 1887. Venezuela also had its origin in 1830 in the break-up of the Bolivar republic of Colombia. The Spanish flag was cut down in this province in 1811 and the struggle against Spain was carried on until 1823, when the Spanish troops were completely expelled. The charter of fundamental laws put into force in 1830 has been several times modified. Of all the South American countries, Brazil remained longest under a monarchy. It was an appanage of Portugal until 1815. The royal family of Portugal fled to Brazil in 1807 and establishing the throne there; the colony was declared a kingdom in 1815. When the royal family returned to Portugal in 1821, Brazil declared itself independent with Dom Pedro, son of Dom Joao VI of Portugal, as emperor. The throne came to Dom Pedro II in 1831 and he ruled until 1889, when, by a revolution, he was deposed and, with his family, exiled to Europe. Brazil was declared a republic under the name of the United States of Brazil. In origin, in career and in form of constitutional government, the South American republics show striking similarity. The cry for liberty expressed in the French Revolution and more especially the successful establishment of the republic of the United States of America inspired the patriots of the southern part of the hemisphere to the struggle for freedom. In establishing constitutional government, they took pattern from the United States of America. Universal suffrage with age and educational qualifications prevails. The central government in each republic consists of a President and two legislative branches, a Senate and a House of Representatives or House of Deputies. Methods of electing the President and members of the Senate and the House vary somewhat, but directly or indirectly adhere to the principle of the rule of the people. The states or provinces that constitute each republic generally have full freedom in their local affairs, although in several republics federal officers have more or less control. Theoretically, most of the South American governments are non-centralized republics. Practically the federal government is a strongly centralized power. The population may be broadly divided, as far as government is concerned, into two classes, the illiterate, ignorant and indifferent and the educated and enlightened, among whom are to be found leaders ambitious and turbulent. Consequently the history of these governments has been almost uniformly a story of intrigue, revolution, sanguinary civil war and domestic upheaval. Presidents have held themselves in power by bayonets, usurpers have arisen supported by the army and dictators have ruled under the name of presidents and nominally so elected.

**Central America.**— The Central American republics are Costa Rica, Guatemala, Honduras, Nicaragua, San Salvador and Panama. Central America, after freeing itself from Spain in 1821, until which time it was known as the kingdom of Guatemala, was attached to the kingdom of Mexico. In 1823 Guatemala, Honduras, Nicaragua and San Salvador formed an independent federal union, under the name of the United States of Central America. Subsequently the states dissolved this alliance and became independent, Guatemala in 1847, Honduras in 1839, Nicaragua in 1858, Costa Rica in 1829 and San Salvador in 1853. These republics are republics in little more than name. Each has a constitutional government and theoretically possesses popular suffrage. In form the federal authority consists of a President and two legislative houses. In fact, the government is always in the hands of a few strong men who exercise autocratic power. Revolutions are frequent, the factions resort to arms whenever desire or opportunity impels and there is frequently no security of life or property. Panama, which may, perhaps, be considered as belonging almost as much to South America as to Central America, was originally part of the republic of Colombia. When the latter country hesitated in coming to an understanding with the United States in regard to the construction of the Panama Canal in 1903, the department of Panama seized the opportunity to secede from her associate. There was a bloodless revolution of a few days. Panama declared itself an independent republic and was recognized at once by the United States. She is now practically under the protection of the United States. See PANAMA.

**West Indies.**— In the West Indies is an island on which there are two nominal republics, known as the Black Republics. Hayti, governed first by Spain and then by France, became free in 1793. First the free colored population gained the franchise in 1791 and then all the negroes in 1793 under the leadership of Touissant l'Ouverture acquired freedom. In the last century the island had varying fortunes, sometimes under English, French or Spanish domination, being twice an empire and several times a republic. San Domingo Republic, on the eastern end of the island, was established in 1844. The government is in the hands of an elected President and two legislative houses, but control of affairs is constantly being changed by revolutions and the setting up of dictatorships. The republic of Hayti, on the western end of the island, has a similar history, under a like form of government proclaimed in 1867. In both republics the government is in the hands of negroes and mulattoes who constitute almost the entire population.

**Mexico.**— From the time that Cortes conquered Mexico, 1519–21, that country remained in the hands of Spain for three full centuries. Finally in 1810 rebellion broke out and after 11 years' struggle, Iturbide, the liberator, was proclaimed emperor. Upon the deposition of Iturbide, the army organized a republic. For nearly half a century there was only the merest semblance of government of any kind. The history of the period is a record of anarchy, intrigue, revolution, military leaderships and dictatorships. In 1857 a constitution was formed, but the existing condition of internal disorder did not terminate. The French made war against Mexico and Maximilian was created emperor by a provisional government in 1862. Upon the execution of Maximilian in 1867 the republic was more firmly established, but it was not until as late as 1878 that under Porfirio Diaz the country became settled. In 1911 a revolution broke out against the Diaz government and a bloody civil war followed for nearly five years, finally terminating in the triumph of the Constitutional party under Carranza who became Constitutional President. (See MEXICO — HISTORY). Mexico is a federative republic, divided into states, each of which manages its own local affairs, while the whole are bound together by fundamental and constitutional laws. The powers of government are exercised by a President, Senate, House of Representatives and judiciary.

**Africa.**— On the western coast of Africa is the republic of Liberia which represents an attempt made by American philanthropists to prove the capacity of the negro race for self-government. Founded in 1820 by the American Colonization Society, it was organized as an independent state in 1847 and acknowledged first by England and other nations of Europe and by the United States in 1861. The constitution of the republic is copied from that of the United States and the right of suffrage is inalienable to every male citizen who owns real estate. As no white man can be admitted to citizenship and as none but citizens can hold real estate, the republic is in absolute control of men of the African race. It is a fairly prosperous country but is heavily loaded with debt and has been constantly torn by political disorder. Executive power is vested in a President and legislative power in a Senate and House of Representatives. In the southern part of Africa the Boers of Dutch origin founded two republics. The Orange Free State was established by Boers who in 1836 and following years quitted Cape Colony in order to separate themselves from British rule there. In 1854 the independence of the republic was declared and a constitution proclaimed. The legislative authority is vested in a single popular assembly elected by the suffrage of adult white males having property qualifications. The President is elected by universal suffrage. Similar to the history of the establishment of the Orange Free State is that of the South African Republic, known also as the Transvaal. It was formed by Boers who moved from Cape Colony and Natal and in 1852 its independence was acknowledged by Great Britain. A constitution was adopted in 1858. There was never lasting peace between the Transvaal and its British neighbors to the south. In 1877 the country was annexed to Great Britain, but the Boers gained their freedom again under the treaty of 1881. Great Britain acquired suzerainty over the foreign relations of the republic in 1884. Friction between the two countries continued unceasingly and finally culminated in open war in 1899 which resulted in the defeat of the Boers and the addition of the republic to the South African possessions of Great Britain.

GEORGE EDWIN RINES.

**REPUDIATION**, a term signifying the refusal of a national or State government to pay pecuniary obligations, especially bonds or other evidences of borrowed money. Nearly all leading countries have, at some time in their history, repudiated indebtedness. England has never repaid money borrowed for public uses from a Florentine merchant by one of the Edwards, and prominent London bankers were ruined when Charles II confiscated their funds deposited in the royal exchequer. France redeemed the paper money called assignats at one-thirtieth of its value. The United States failed to redeem the Continental currency. In the disastrous financial period of 1840 and several subsequent years, the States of Illinois, Indiana, Pennsylvania, Maryland, Mississippi, Michigan and Louisiana suspended payment of interest on their debts incurred in promoting public improvements, but all of them, except Michigan, Mississippi and Louisiana, eventually fulfilled their obligations as to the capital of the debt. Governor McNut of Mississippi advocated «repudiating the sale of certain of the State bonds,» on account of alleged fraud and illegality in the issue, and this was the origin of the popular use of the term «repudiation» as applied to that course on the part of a State. The legislature of Mississippi refused to accept the governor's suggestion, but while the bonds were not formally repudiated, they were not redeemed. Michigan provided for the repayment of money actually received, repudiating obligations shown to have been issued without a fair equivalent, even although in the hands of innocent parties. Louisiana paid her creditors in depreciated State bonds. Minnesota refused to honor certain railroad bonds guaranteed by the State, in 1858, claiming that the railroads had failed to comply with the conditions on which the guarantee was given. The question of paying this indebtedness was agitated for many years, and finally in 1880 Minnesota compromised by agreeing to pay 50 cents on the dollar.

After the Civil War the Southern States fell largely under the rule of unscrupulous politicians known as «carpet-baggers,» intruders from the North took advantage of the prostrate condition of the Southerners, and inflicted much wrong and injustice. Obligations were issued for which no reasonable equivalent ever reached the State treasuries, and the impoverished communities, when the native whites obtained supremacy again, found themselves deeply in debt. Georgia, Virginia, North Carolina, South Carolina, Florida, Alabama, Mississippi, Louisiana, Arkansas and Tennessee either scaled their debts to a figure which represented value received, or refused to pay obligations alleged to be tainted with injustice and corrpution. In all, the Southern States scaled down their indebtedness from about $235,000,000 to a little more than $100,000,000. While there was rough justice in these reductions, yet the natural result was that foreign investors were shy of State securities for many years. Cities and towns of the United States have sought at times to repudiate a portion of their debts, and in case a city actually is bankrupt, it is not clear how the debt can be collected. Under the 11th Amendment to the national Constitution, States cannot be sued by individuals, and creditors are, therefore, powerless to attempt collection in the courts.

Spanish-American republics, with some honorable exceptions, have persistently ignored their financial obligations. An attempt by France, England and Spain, to collect debts due by Mexico, was the cause, or more correctly the excuse, for the ill-fated effort to establish an empire in Mexico, with Maximilian on the throne. Since the growth of Mexico in prosperity and position among the nations, under the beneficent despotism of Diaz, the Mexican government has voluntarily taken steps to meet its financial obligations.

**REPULSION,** *in physics,* the force which impels certain bodies or their particles to recede from each other. Apparent repulsion exists when there is a greater attraction elsewhere. No repulsion exists between bodies at sensible distances, except when they are in certain electric or magnetic states, in which case the repulsions between them are in the inverse ratio of the square of the distance. At insensible distances, some influence keeps the particles of a body from being in absolute contact, whence results the phenomenon of elasticity. The motions produced by heat are also a cause of strong molecular repulsion. The molecules of gases are always in a state of mutual repulsion. Compare ATTRACTION; MAGNETISM.

**REPUTED OWNERSHIP,** *in law,* is a phrase used of one who has to all appearances the right and actual possession of property. «The false credit raised by a person exercising all the rights of ownership over a subject not his own has led to the adoption of the rule that the creditors of the reputed owner may take the subject as if it were his own.» See BANKRUPTCY LAW.

**REQUEÑA,** rā-kā'ñä, Spain, town in the province of Valencia, 40 miles west of Valencia. The remains of the tower of the ancient church of San Salvador; the castle towering above Las Cabrillas (a prominent summit), and the ruins of walls which formerly surrounded the city, are the chief points of architectural interest. The chief industry consists in the culture of silk, saffron, grain, fruit and wine. Pop. 14,500.

**REQUEST, Letters of,** (1) *in law,* a written request by one court asking another court in a different jurisdiction for assistance in performing a judicial act, as to enforce a monition, execute a judgment or the like. They are used in the United States in admiralty practice. They have been superseded to some extent, both in the United States and England, by commissions for taking evidence. (2) *In ecclesiastical law,* a written request to send a cause to another court. Usually letters of request lie only in cases in which an appeal would be proper.

**REQUIEM,** rē'kwĭ-ĕm, the Roman Catholic mass for the dead, named from the first word of the Introit «*Requiem æternam dona eis, Domine.*» While the term covers the entire mass it is more distinctively employed to designate the musical setting for the mass; and in common usage has come to mean a musical service or hymn for the dead. Among the most famous musical settings for the Requiem mass are those of Palestrina, Vittoria, Mozart, and two by Cherubini and Verdi.

**REREDOS,** rēr'dŏs, in church architecture, usually the screen back of the altar, which is adorned with sculptured work comprising the tabernacle, niches, statuary and the like; in some great cathedrals, for example, in England, the cathedrals of Durham, Winchester and Saint Albans, the reredos is a mass of most elaborate carving which reaches nearly to the graining.

**RES JUDICATA,** rēz joo-dĭ-kā'tä, a law term meaning that the subject matter of an action has been already decided by a court of competent jurisdiction. A matter so decided cannot again be made a ground of action between the same parties.

**RESACA, rā-sā-kä, Battle of.** While the armies of Generals Thomas and Schofield were threatening an advance from the north on Dalton, Ga. (q.v.), General Sherman ordered General McPherson, commanding the Army of the Tennessee, to move southward through Snake Creek Gap and interpose between Dalton and Resaca. McPherson moved from Gordon's Springs, 8 May 1864, his advance bivouacked that night in the Gap and next morning pushed through it, defeated a brigade of Confederate cavalry at the eastern end of it, and approached to within a mile of Resaca, on the Oostanaula, where he found the enemy in position too strong to be attacked; and being unable to find a good road by which he could quickly reach the railroad, north of Resaca, and fearing an attack upon his own left flank, he prudently withdrew, after some severe skirmishing and took a strong position near the east end of Snake Creek Gap. Sherman now resolved to transfer the greater part of his army to join McPherson. Howard's Fourth corps and a small force of cavalry were to demonstrate on Buzzard Roost Gap and occupy Confederate attention north of Dalton. On the 10th Hooker's 20th corps moved through Snake Creek Gap and joined McPherson. Palmer's 14th corps and Schofield's 23d corps followed, and on the 12th the whole army except Howard's corps and the cavalry with it, was through the Gap. On the morning of the 13th McPherson, preceded by General Kilpatrick's cavalry, led the advance on the direct road to Resaca. Thomas, with the corps of Palmer and Hooker, was to move on McPherson's left, and Schofield on the left of Thomas. The country was covered by dense forest, and the movement of troops was difficult. Kilpatrich drove the Confederate calvary to within two miles of Resaca, and was wounded, and his cavalry wheeled out of the road, allowing McPherson to pass, who, encountering the Confederate pickets near Resaca, drove them in and occupied a range of bald hills, his right on the Oostanaula, about two miles below the railroad bridge, and his left abreast the town. Thomas came up on McPherson's left and faced Camp Creek. Schofield worked his way through dense forest and came up on the left of Thomas, but it was noon of the 14th when these movements were completed, at which time Howard's Fourth corps, following Johnston from Dalton, had reached a position about a mile north of Schofield's left. Johnston abandoned Dalton about midnight of the 12th, and during the 13th formed his army covering Resaca, Polk's and Hardee's corps west of the place, facing west and covering the railroad bridge and a trestle bridge. Polk rested his left on the Oostanaula, and Hood's corps on the right of Hardee's extended across the railroad to the Connesauga, facing to the northeast. Wheeler's cavalry was on the right, and Jackson's cavalry on the left guarded the Oostanaula from Resaca to Rome. There had been severe skirmishing on the afternoon of the 13th between the troops of McPherson and Polk, and it was renewed on the morning of the 14th, and in the afternoon McPherson carried a bridge on Camp Creek, crossed it and secured a commanding position very close to Polk's main line and intrenched. Confederate efforts to retake the position were repulsed. Farther to the left Palmer's 14th and Schofield's 23d corps became engaged with Hardee on Camp Creek; parts of Schofield's corps were repulsed with great loss, another part succeeded in making a lodgment beyond the creek. Two divisions of Howard's corps coming in from the north were sent to Schofield's support, leaving Stanley's division in echelon to the left. Hooker's corps was sent to the left. Johnston had noted the exposed position of Sherman's left and ordered Hood, with the divisions of Stewart and Stevenson to attack and turn it. Late in the afternoon Hood attacked Stanley, outflanked him and was dirving him back when the advance of Hooker's corps, Williams' division, came up, repulsed Hood and drove him back to his intrenchments. Skirmishing was resumed along the entire line on the morning of the 15th, and Sherman ordered an advance of Hooker on the left, and the two divisions of the 23d corps were withdrawn from the centre and marched to the extreme left in support. It was after noon when Hooker advanced, Butterfield's and Geary's divisions on the right and centre, and Williams' on the left. Hood, with the divisions of Stevenson and Stewart, supported by three brigades from Polk's and Hardee's corps, made a simultaneous advance from his works. Stevenson on his left was struck first by Butterfield and then by Geary, before he had gone far from his works, and after a severe fight was driven back to them, leaving a four-gun battery in advance of his line, which remained between the two lines until night, when it was secured by a detachment of Geary's division. On Hood's right Stewart's division swung to the left, drove Williams' skirmishers from the railroad and, crossing, assaulted Williams' main line most vigorously, but was bloodily repulsed and fell back to its intrenchments. A part of Schofield's corps on Hooker's left took part in this engagement. Hooker's loss was over 1,600. On the 14th Sherman had ordered a pontoon-bridge to be thrown across the Oostanaula at Lay's Ferry, in the direction of Calhoun, and Sweeny's division of the 16th corps was ordered to cross it and threaten Calhoun. Sweeny crossed one brigade, drove some Confederate cavalry from the opposite bank, then hearing that the Confederates were crossing above him, he withdrew the brigade and retired his entire division half a mile to a less exposed position. On the morning of the 15th he moved back to the river and crossed it, laid a pontoon-bridge and constructed works. Here he was fiercely attacked by Walker's Confederate division, which was repulsed. The presence of a part of Sherman's army east of the Oostanaula determined Johnston to retreat, and that night he abandoned Resaca and marched for Calhoun. Sherman occupied Resaca on the morning of the 16th and started in pursuit. The Union loss at Resaca was about 600 killed and 2,147 wounded. The Confederate loss was about 300 killed, 1,500 wounded and 1,000 missing. Consult 'Official Records' (Vol. XXXVIII); Cox, 'Atlanta'; Van Horne, 'History of the Army of the Cumberland' (Vol. II); Sherman, 'Personal Memoirs' (Vol. II); The Century Company's 'Battles and Leaders of the Civil War' (Vol. IV); Johnston, 'Narrative of Military Operations.'

E. A. Carman.

**RESACA DE LA PALMA**, rā-sä'kä dā lä päl'mä, **Battle of**, in the Mexican War (q.v.). After the battle of Palo Alto (q.v.), 8 May 1846, the Mexican general Mariano Artista fell back on the road to Matamoras and took position in a ravine called Resaca de la Palma (Palm Ravine) in Cameron County, Tex., four miles north of Brownsville. Having been reinforced by 2,000 men, bringing his army up to about 6,000 infantry and 800 cavalry, he determined to resist the further advance of Gen. Zachary Taylor (q.v.) and the American army of about 2,200 troops. About noon of 9 May, having sent his wounded back to Point Isabel, Taylor began his advance and came upon the Mexicans, strongly intrenched in the ravine which forms a natural breastworks, defended in front by artillery and well secured in the rear against the possibility of being flanked. On the road along which the Americans must approach the Mexicans had established a three-gun battery so as to rain a shower of grape-shot on the advancing enemy. Perceiving that the severest struggle must take place on this road, Taylor, after sending some troops into the chaparral on either side of the road, ordered Capt. Charles A. May with a squadron of dragoons to take the battery. Though the Mexican shot tore his ranks to pieces, May gallantly executed this task, drove the Mexicans from their guns and captured General La Vega, but was gradually being driven back by superior numbers when Taylor ordered the 5th and 8th infantry to charge. This decided the battle; the Mexicans fled from their positions and were put to total rout, the pursuit being halted only at the river. Taylor might have entered Matamoras at once but took time for his troops to recover from their labors and did not enter the town until the 17th, without encountering any resistance from Arista. Taylor's loss was 39 killed and 83 wounded, while the Mexican loss is variously stated, though it probably was between 500 and 600. Taylor then remained practically inactive until he had fought the battle of Monterey (q.v.). Consult ‹Executive Documents,› 30th Congress, 1st session, Vol. VII, No. 60, pp. 293–296; Montgomery, H., ‹Life of Taylor,› pp. 141–187; Howard, ‹Life of Taylor,› pp. 119–130; Bancroft, H. H., ‹Mexico,› Vol. V, chap. XIV; Ladd, H. O., ‹The War with Mexico,› pp. 59–69; Wiley and Rines, ‹The United States,› Vol. VII, pp. 197–200.

**RESCISSION**, rē-sĭsh'ŭn, a legal term designating the act of rescinding or abrogating a voidable contract, that is, a contract in force but which owing to some injustice, infirmity or demand of justice or public policy may be annulled, and refers to the dissolution of the contract through the will of the parties involved instead of through an action in court, in which case the term «cancellation» is employed. The rescission may take place through the inclusion of a clause providing for it in the contract; through evidence of fraud practised when the contract was made; inadequacy of consideration through the employment of fraud; the exercise of undue influence, as resulting from confidence and friendship, the relation of husband and wife, parent and child, principal and agent, trustee, executor or administrator and heir or legatee; mistake in drafting the contract, or misunderstanding of the terms employed, or want of authority on the part of an agent or officer; the contractors of minors on the application of the minor, and of people insane or under the influence of intoxicants, or made under duration or stress; failure of one of the contracting parties to perform his part of the contract, either through inability or refusal; failure of consideration, or non-existence of subject matter, but not through depreciation after the consummation of the contract; and, in the case of a selling contract, the discovery before transfer of possession, that the purchaser intends making illegal use of the purchase. Insurance policies cannot be rescinded by either party without the consent of the other unless the right of rescission be included in the policy. The right to rescind belongs only to the party without fault. The act of rescission may be effected by an act of party, notifying the other of intention; or by an act in equity in order that the instrument may not later be used to the annoyance or disinterest of an innocent party. Right to rescind is lost through unreasonable or inexcusable delay, or by an act at law to recover damages; but an action in court for recovery of damages or property may follow rescission. The party rescinding must place the other *in statu quo;* he may not rescind and retain the benefits derived from the contract; and no rights received through it remain upon its rescission.

**RESCRIPT**, the term applied in Roman law to the answers of popes and emperors to questions in jurisprudence propounded to them officially. The rescripts of the Roman emperors constitute one of the authoritative sources of the civil law. These were usually addressed to the provincial magistrates, to corporations or even to individuals. The rescripts of Justinian admitted into the code have acquired great authority. The rescripts of the popes of Rome are still referred to as fundamental in Catholic theology.

**RESCUE**, (1) *in law,* the forcible setting at liberty of a person or thing in legal custody. The punishment varies, depending on the circumstances. In the case of persons, the rescuer was formerly held to be guilty of the same degree of crime as the prisoner if the former knew the prisoner was in lawful custody at the time. (2) *In international law,* the retaking of a prize by the persons taken with such prize.

**RESCUE**, or **SCHRADER'S BROME GRASS.** See GRASSES IN THE UNITED STATES.

**RESECTION**, *in surgery,* the operation of cutting out the diseased bone of a joint. It frequently obviates the necessity of amputating the whole limb, and by the removal of the dead parts leaves the patient a limb which, though shortened, is in the majority of cases better than an artificial one. Resection, which is one of the triumphs of modern surgery, became a recognized form of surgical operation in 1850.

**RESERVATION**, *in law,* (1) the withholding of an interest in property granted, or the interest so withheld. (2) Notice that specific rights are retained. (3) That part of a deed in which the vendee reserves an interest in the property granted. A reservation must be carefully distinguished from an exception. The latter denotes a specific part of land not conveyed by the grantor, while a reservation denotes that the grantor reserves a right in land which he has conveyed. This right cannot be granted to any one but the grantor of the land. A reservation may be of a life estate or even a right of fishing. (4) In the United States the withholding of certain territory, as for public uses, or the territory so held.

**RESERVATION, Papal, of Benefices,** the taking of the bestowal of certain Church benefices and dignities out of the hands of the local church rulers and the attribution to the Roman Pontiff of the right to confer the same; or, what amounts to the same thing, the requiring of bishops, chapters and other persons or ecclesiastical bodies possessing the right of conferring benefices, that in case of vacancies they should bestow such benefices on persons nominated by the Pope. One reason alleged in favor of this practice was that thus the several national churches were linked more closely by personal ties of gratitude and affection to the central see, and through it to each other; another was that thus the Supreme Pontiff was provided with the means of rewarding those who had labored meritoriously in the cause of the Holy See and the Church Catholic.

**RESERVATION OF THE EUCHARIST,** the keeping of the sacramental species against emergent occasions, as the communion of the sick in their homes, for the Mass of the Presanctified on Good Friday, for the rite called Benediction of the Blessed Sacrament and for the perpetual adoration. Mention is made in authors of the times immediately following the Apostolic Age, of the custom of the bishops sending to one another the Eucharist in token of Christian union and fraternity. Saint Ambrose (4th century) tells of the Eucharist being carried by lay persons; in the Middle Ages this custom was still in vogue. Thomas à Becket carried the Eucharist with him when he went to meet Henry II and Saint Louis carried the sacred species with him on his Crusade. The sacred host is now customarily reserved in all Catholic churches whether of Latin or Oriental rite, being kept usually in the tabernacle of the high altar in the Latin Church and in Greek churches in a special receptacle, *artophorion,* behind the altar; whenever it is reserved a lamp is kept ever burning before it.

**RESERVATIONS, Game.** See GAME PRESERVES.

**RESERVATIONS, Indian.** When the settlers from Europe came to realize that the Indians had human rights, and ought not to be enslaved or exterminated, the rule was generally adopted of confining the tribes to reservations, both for their own protection from unprincipled whites and for the security of the white population. New York, Massachusetts, Connecticut, Rhode Island and other States enforced this policy in the colonial period and after independence, and the United States government has carried it out from an early date. Southern tribes east of the Mississippi were removed to the Indian Territory, designated by solemn pledge of the national government as a permanent home for their race, and there some of the tribes have achieved a high degree of civilization and gained considerable wealth. They are largely intermarried with whites and to some extent with negroes, whom they formerly held as slaves. Other tribes, chiefly from the Southwest, have been gathered into the Indian Territory, but large Indian reservations, mainly of Sioux, are still maintained in the Northwest, and altogether the various tribal reservations in the different States and Territories number about 185. The reservations are carefully guarded against intrusion by unscrupulous whites, and provision is made for the intellectual and physical welfare of the Indians and for leading them to adopt civilized methods of self-support, instead of depending on the chase which now offers only the most precarious returns, or on government aid, which, however, is not withdrawn under any circumstances while an Indian is in need of it. The sale of intoxicating liquor to Indians is severely punished when detected, but the law is frequently evaded.

In 1917 the Indian population, as returned by the leading States having reservations, was as follows: Oklahoma, 119,108; Arizona, 44,617; South Dakota, 26,246; New Mexico, 20,853; California, 15,362; Minnesota, 11,777; Montana, 11,525; Washington, 11,181; Wisconsin, 10,216; North Dakota, 8,903; North Carolina, 8,118; Nevada, 7,944; Oregon, 6,612; New York, 6,272. No other State had as many as 4,000.

**RESERVATIONS, Military.** The United States government maintains military reservations in all the States and dependencies. Very many of these are used for rifle ranges; others for barracks, training grounds, cemeteries, forts and arsenals. They were extensively utilized for the war in 1917, and in many cases new lands have been acquired for military training. See RESERVE.

**RESERVE,** in military affairs, has several significations. In battle the reserve consists of those troops not in action, and destined to supply fresh forces as they are needed, to support those points which are shaken and to be ready to act at decisive moments. Napoleon's guards, and his disposition of them, are models. They often decided the victory when the enemy felt sure of success. The reserve of ammunition is the supply of warlike stores placed close to the scene of action to allow of the supply actually in the field being speedily replenished.

The term reserves is also applied to those forces which are liable to be called into the field on great emergencies, for the purposes of national defense; which have received a military training but follow the ordinary occupations of civil life and do not form part of the standing army. Such reserves now form a part of all national troops organized on a great scale. They are entitled to wear «U.S.R.», on their uniforms.

In 1917 the United States army began to establish reserve officers' training camps, and by 1 Jan. 1918 had issued more than 60,000 officers' commissions from these camps. A third series of such reserve officers' camps was started January 1918. (See RESERVATIONS, MILITARY). The United States naval reserve force was authorized by Congress, 29 Aug. 1916. Only citizens are enlisted; the pay is $12 a month minimum. The fleet naval reserve is composed of retired naval officers and men who receive retainer pay of $50 per annum and upward, being liable to be called upon to serve at their former rank. The naval reserve is composed of ex-merchant marine men who are liable to be called to duty either in the regular navy or on auxiliary vessels. They receive a small retainer pay, varying with their previous earnings. There is also a naval auxiliary reserve, made up of officers and men who have been listed by the Navy Department as desirable for enlistment. The naval coast defense reserve is composed of owners and operators of yachts, motorboats, or men who are familiar with coasting, radio work, handling mines and torpedoes, etc. The naval reserve flying corps is operated on similar lines and is open to men who understand something of aviation. There is also a medical reserve corps connected with the navy.

**RESERVOIR**, a large and commodious receptacle for storing water for any purpose, but more commonly for supplying cities and towns, feeding canals, driving machinery and the like. A dam differs from a reservoir in that the name applies only to the artificial structure that holds back the water, while the reservoir includes also the entire artificial lake and its appurtenances. The construction of a reservoir is of much importance and requires great engineering skill. In the selection of a site the great object should be to choose a position which will give the means for collecting a large supply of rainfall with as little recourse as possible to artificial construction. An advantageous site would be, for instance, in the narrow gorge of a valley through which a stream passes, and at a place where the gorge widens out on the side looking toward the source of the stream. Particular care, however, is necessary to discover whether the position chosen communicates with the courses of underground waters or springs, as disastrous results have frequently been occasioned by ignoring this. As a general rule the best and safest method is to establish reservoirs in valleys filled in with clays derived from the decomposition of the primary formations, which are very slightly permeable. The embankments or dams may be constructed either of masonry or earth-work, the latter being generally the more economical method. Where the reservoir requires to be constructed on perfectly level ground the excavation should be calculated so as to equal the embankment. The earth-work of dams should be as much as possible of material — such as a mixture of clay and gravel — which would resist the infiltration of the water; but as it is impossible always to obtain such material in sufficient quantities, engineers have recourse to what is termed a *puddle-wall,* formed in the middle of the embankment. This wall is constructed of well-worked clay, the foundation of the puddle being a trench dug down to impervious rock or clay, and its breadth should be on an average about one-third the height of the embankment. The inside slope of the embankment is usually 1 perpendicular to 3 horizontal, sometimes it is steeper; the outside slope may be 1 perpendicular to 2 horizontal; and the height above the surface of the water is often 4 to 7 feet. The earth-work ought to be constructed of thin layers, carefully rammed so as to secure their equal settlement; the inner face requires to be protected by stones in order to resist the action of the water. The waste-weir, to admit of the surplus water flowing over, should be from 4 to 6 feet below the surface line of the embankment, built of strong mason-work and of a width such that with a flow of 2 feet over the crown it should be able to discharge all the water brought down by the severest floods ever known to fall upon the basin supplying the reservoir. Many of the accidents that have occurred were due to deficiencies in the waste-weirs. In the reservoirs of which the dams are built of masonry there is no necessity for a waste-weir, as then the water may be allowed to overflow the wall, there being no fear of its endangering the work. The outlet at the bottom, by which the water to be used is drawn off from the reservoir, may consists either of a tunnel, culvert or iron pipes provided with suitable sluices, and these should be so constructed that access may be had to them even when the reservoir is full.

The true principles for the proportioning of masonry dams were not thoroughly investigated until about the middle of the 19th century and subsequently. This was first done by French engineers, and many such dams have since been constructed in France, Algeria, the United States, etc. The highest of all such dams is that of the New Croton reservoir, New York, its height being 248 feet; thickness at bottom, 185 feet; at top, 16. The first great masonry dam built in France on the newer principle was that of Furens (1860–65); height, 184 feet; thickness at bottom, 162; at top 11. San Mateo reservoir dam near San Francisco is 170 feet high; thickness at bottom, 176; at top, 20. The Periyar dam, India (1890–95), has a height of 173 feet; bottom thickness, 139; top, 12. In the famous reservoir of Alicante, Spain, executed 1579–94, the wall is 67 feet thick at the top, 112 feet at the bottom, and the height 141 feet. In England the preference is generally given to earthen dams. Sometimes natural lakes are used as reservoirs, instances of which are Loch Katrine, for the water supply of Glasgow, and Lake Thirlmere, in Cumberland, for the supply of water to Manchester. Distributing reservoirs for towns are generally built of masonry, but sometimes largely of steel. Reinforced concrete is now generally favored. They ought to be placed high enough to command the highest part of the town, and ought to be capacious enough to contain half a day's supply, their chief use being to store the surplus water during the night. Among notable modern storage reservoirs for towns are those of the Vyrnwy, for supplying Liverpool, containing 11,900 million gallons; Vehar (10,800 million gallons), for Bombay; San Mateo (31,000 million gallons), for San Francisco; and the New Croton (32,000 million gallons), for New York. See DAMS; ROOSEVELT DAM; IRRIGATION.

**RESHT**, rĕsht, Persia, capital of the province of Ghilan, 150 miles northwest of Teheran, near the Caspian Sea, and with a port at Enzeli. On the highway of commerce and travel between Europe and Persia, its geographical position has a special significance. There is an extensive manufacture and trade in silk. Pop. about 40,000.

**RESIDENCE**, the place which a man regards as his home, even although he may be absent from it for long periods of time. In the United States the question of residence is of the greatest importance, involving citizenship, the right to vote, to sue at law, marital relations, questions of taxation and of the disposition of property by will or inheritance. It has, therefore, frequently engaged the attention of the courts, and the decisions have not been uniform. As a rule a man is assumed to reside where his family have their home, provided he is not separated from them by law, and provided they have not refused to accompany him to a fitting residence elsewhere. When a man has a summer and a winter home, the question of residence is usually determined by his personal declaration, and his payment of personal taxes in the place which he elects to call his residence. Courts regard with suspicion and disfavor change of residence for the obvious purpose of evading the laws of the State left, or of escaping taxation. Yet the man or woman who travels a great deal has an undoubted right to declare some place as his or her home and residence for all legal purposes. While the privilege may be, and doubtless is, often abused, yet the condition continues that residence is very largely a matter of where the individual declares it, provided he regularly spends a portion of his time there. See Domicile.

**RESIDUE,** *in law,* that which remains of an estate after all debts, legacies, and expenses are paid. If no residuary legatee is mentioned in the will, the residue goes to the next of kin.

**RESIN.** See Rosin.

**RESIN WEED.** See Compass Plant.

**RESISTANCE, Electrical,** that property of electrical conductors in virtue of which the passage of a current of electricity through them is necessarily accompanied by the dissipation of a part of the energy in the form of heat. It is manifested not only in a linear conductor like a wire, but also in solids of large extent in two or three dimensions, as when a current passes from one point to another of a sheet of metal, or of a mass like an ingot or casting. It is chiefly in connection with wires, however, that electrical resistance is of practical importance, and it is only in this aspect that the subject will be here considered.

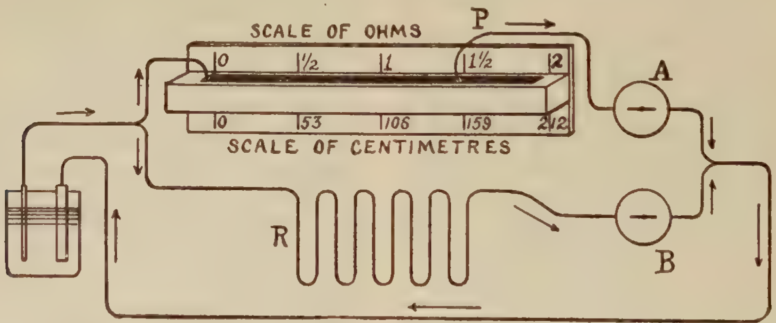

Fig. 1.

The passage of a current of electricity through a wire or rod has been likened to the flow of a current of water through a pipe, the water corresponding to the electricity, and the friction between the water and the pipe to the electrical resistance of the wire. The analogy is not perfect, but it is useful in forming a good conception of electrical resistance. The energy of the moving current of water is gradually dissipated in the form of frictional heat, and the energy of the moving current of electricity is similarly dissipated on account of the electrical resistance of the conductor through which it is passing. The unit in terms of which electrical resistance is measured is the «ohm,» which may be taken as sensibly equal to the resistance of a column of mercury 106.3 centimeters long and one millimeter in cross-section, at the temperature of freezing water. (The Britsh Board of Trade specifies that the mercury column shall be 106.3 centimeters long and that it shall have a mass of 14.4521 grammes. This is supposed to be identically the same definition, but it is more convenient for practical work, because in reproducing the ohm by means of a mercury column a glass tube would be filled with mercury and the sectional area of the column would be determined by weighing). (See also Units). The phenomena of electrical resistance have been studied, both mathematically and experimentally, by many eminent physicists; but the most important contributions to our knowledge are due to George Simon Ohm (for whom the «ohm» was named), and to James Prescott Joule. Ohm investigated the manner in which the flow of electricity through a conductor depends upon the resistance of the conductor, while Joule determined the law that governs the dissipation of energy from a conductor, in the form of heat. In the present article it will be assumed that the currents in the conductors are steady, that the electromotive forces in the circuits are constant and that the conductors are stationary (so that their coefficients of induction remain constant). The laws of Ohm and Joule may still be applied, though in a somewhat more generalized form, to conductors in which these three conditions are not fulfilled; but for the proper understanding of the phenomena in such cases, it is necessary to refer to the more advanced treatises on electricity.

One of the results of Ohm's investigation was, that in a branched circuit, in which the resistances of the two branches are precisely equal, the current divides in such a manner that exactly one-half of it traverses each branch. By taking advantage of this fact, we can determine the resistance of a proposed conductor in the following manner: Let *R*, in Fig. 1, be the resistance to be measured, and let this be placed in one of the branches of the circuit. In the other branch of the circuit is a standard volume of mercury, whose cross-section is one square millimeter, and whose temperature is that of freezing water; the resistance of such a column being (as noted above) one ohm for (say) each 106 centimeters of its length. The mercury column is arranged so that the current enters it at the left end; and the current is led away from the mercury column again by means of the movable wire *P*, whose point of contact with mercury can be shifted to the right or left, at will. The measurement consists in moving the point *P* until the two galvanometers *A* and *B*, one in each branch of the circuit, show that the currents in the two branches are precisely equal. We then know that the resistances in the two branches are also equal. In preparing the engraving it has been assumed that the equality has been observed to subsist when that part of the mercury column which is included in the circuit is 150 centimeters long, and, therefore, has a resistance of 1.5 ohms. If the galvanometers and connecting wires are identical in both branches, it, therefore, follows that the resistance of the coil *R* is also 1.5 ohms. The method of measuring resistances here described is presented in order to illustrate the fundamental idea of electrical resistance. In the practical measurement of resistances a more refined method, presently to be described, is employed.

It is found that the electrical resistance of a linear conductor of uniform cross-section is proportional (1) directly to the length of the conductor, (2) inversely to the area of its cross-section and (3) directly to a certain numerical factor characteristic of each material, and which is called the «specific resistance» of the material. The «specific resistance» (or «resistivity») of a substance is the resistance, at the freezing point of water, of a conductor composed of the given substance, and having a length of one centimeter and a cross-section of one square centimeter. The specific resistance of a given metal varies to a certain extent with the physical condition of the metal, but the values given in the accompanying table will be found useful for many purposes:

Specific Resistance of Metals.

| | |
|---|---|
| Mercury | 0.000 094073 ohm. |
| Silver (hard drawn) | 0.000 001652 " |
| Silver (annealed) | 0.000 001521 " |
| Copper (hard drawn) | 0.000 001622 " |
| Copper (annealed) | 0.000 001590 " |
| Gold (hard drawn) | 0.000 002118 " |
| Gold (pure and soft) | 0.000 001952 " |
| Aluminum (hard drawn) | 0.000 003160 " |
| Aluminum (annealed) | 0.000 002946 " |
| Zinc (pressed) | 0.000 005690 " |
| Platinum (pure annealed) | 0.000 008222 " |
| Iron | 0.000 010200 " |
| Nickel (specially pure) | 0.000 006935 " |
| Lead (pressed) | 0.000 019850 " |
| Manganin | 0.000 041000 " |
| German silver | 0.000 020500 " |

In practice, mercury columns are not used as standards of resistance, because they are not convenient to manipulate. The mercury column is selected in defining the «ohm» for general purposes, because it is easy to obtain mercury in a satisfactory state of purity, and also because all uncertainties relating to internal stress and physical state are eliminated by the use of a fluid standard. An isolated observer, for example, who wishes to construct a resistance of one ohm for experimental purposes, can do so readily enough by preparing a column of pure mercury of known length and cross-section. He can then compute the resistance of this column, at the freezing point of water, and in this way he can obtain a standard of considerable accuracy. In practical work, however, it is customary to employ, as standards of resistance, coils of wire that are wound upon spools or bobbins. These are standardized either by comparison with other coils whose resistance are known, or by direct comparison with a mercury column of known dimensions and assured purity. A bobbin that is wound with wire as an ordinary spool is wound with thread possesses a considerable coefficient of self-induction if the length of wire is at all great; and this tends to impair its efficiency as a standard, because in the practical measurement of resistance it is desirable to have the self-induction of the standard as small as possible. Standard resistance coils are, therefore, wound in a special way, with the idea of reducing the self-induction as much as possible. One-half of the wire is wound about the central core (or spool) in one direction, and the other half is wound in the opposite direction so that if an iron core were placed in the axis of the spool, and a current were sent through coil, the magnetic effect upon the central iron core would be zero. By winding the wire in this way, the self-induction of the coil may be rendered negligible.

The resistance of a conductor varies with temperature and, although the magnitude of the variation differs with different metals, and even with the physical state of any one metal, it may be taken, roughly, as increasing by about 0.21 of 1 per cent, for each Fahrenheit degree of rise of temperature, for copper and silver and several of the other pure metals. The resistance of liquid mercury increases much more slowly with temperature, the coefficient of mercury being only about one-fifth of that stated above. The resistance of carbon diminishes as the temperature rises. In accurate electrical work it is evidently essential, in view of the variation of resistance with temperature, either to keep the temperature of the standard coils constant, or to ascertain the coefficient of variation of resistance with temperature with considerable care, so that a suitable correction may be applied for any departure of the temperature of the standard coils from the one temperature at which their resistances are accurately known. In practice it is usual to determine the temperature coefficient with as much accuracy as possible, and then to keep the temperature of the coil as near as practicable to the temperature at which it has been standardized. Any error in the determination of the temperature coefficient will then have but small effect upon the calculated resistance of the standard. Many attempts have been made to prepare alloys which shall have negligible temperature coefficient; and while no alloy has been found whose electrical resistance is absolutely independent of the temperature, several have been prepared whose temperature coefficients are quite small. German silver is one of the commonest of these alloys, the composition of that which is used in the preparation of resistance wire being (by weight) four parts of copper, two of nickel and one of zinc. The specific resistance of this alloy is about 13 times that of copper, and its temperature coefficient is only about 0.022 of 1 per cent, per degree Fahrenheit. «Platinum-silver,» as used for electrical resistance standards, is composed of two parts (by weight) of platinum to one part of silver. It has a specific resistance about 15 times as great as that of copper, and its temperature coefficient per Fahrenheit degree, is only about 0.017 of 1 per cent. «Manganin» has largely come into favor for electrical resistance standards in recent years, the composition recommended by the Reichsanstalt being (by weight) 84 per cent of copper, 12 per cent of manganese and 4 per cent of nickel. Its specific resistance is about 20 times that of copper, and its temperature coefficient is only about 0.0013 of 1 per cent per Fahrenheit degree, at ordinary temperatures; the coefficient diminishing as the temperature rises, until, at about 113° F., the coefficient becomes rigorously zero. At still higher temperatures, the coefficient of manganin becomes negative; but at all temperatures it is so small that it can be neglected for all purposes save those in which the highest attainable degree of accuracy is required.

In the preceding paragraph it was tacitly assumed that the temperature was not widely different from that prevailing in rooms in which electrical measurements are usually made. Kamerlingh Onnes has shown, however, that the relation between resistance and temperature undergoes a remarkable change in the vicinity of the absolute zero. Experimenting, for example, with a coil consisting of 1,000 turns of fine lead wire, the two ends of which he had fused together, he found that, although the coil had a resistance of 734 ohms at the temperature of the laboratory, its resistance appeared to totally vanish at 6° C. on the absolute scale. The coil was surrounded with liquid helium, and thereby cooled to 4.26° C. (absolute),—which is the boiling point of helium under atmospheric pressure,—and an electric current was then produced in it, by induction. At the temperature of the laboratory this current would die out to practically nothing within an extremely small fraction of a second after the removal of the exciting cause; but at the temperature of boiling helium the current persisted for many hours. It fell off, in fact, at the rate of less than 1 per cent per hour. If, however, the coil were lifted out of the helium, the current ceased abruptly as soon as the temperature rose to 6° C. (absolute),—this being the «vanishing point» of the resistance of lead, above which the energy of the current was quickly dissipated in the form of heat, in the usual way. In another experiment Onnes used a wire of solid mercury, the resistance of which, just below the freezing point of mercury, was about 50 ohms. As the temperature of this wire was lowered, the resistance diminished regularly until it became reduced to 0.12 ohm at 4.3° C. (absolute). Upon further cooling the resistance fell off abruptly at about 4.19° C. (absolute), to 0.00001 ohm; and at 2.5° C. (absolute) the resistance of the mercury was only one ten-thousand-millionth of the resistance observed at the freezing point of water. At 1.7° C. (absolute) a mercury wire will conduct a current having a density of 1,000 amperes per square millimeter, without showing any measurable difference of potential, and without developing heat. Ohm's law no longer holds, and the applied electromotive force may have to be increased a thousand fold, in order to realize a 10 per cent increase in the current. When a metal exhibits these singular properties, by reason of being cooled to a temperature lower than that at which its resistance practically vanishes, it is said to be a «superconductor.» In the *Chemisch Weekblad* (Amsterdam), Vol. XVI, p. 640, C. A. Crommelin gives a historical and theoretical discussion of the work of Kamerlingh Onnes along these lines, and appends a valuable bibliography bringing the subject up to 1919.

In the accurate measurement of electrical resistance, the device known as «Wheatstone's bridge» is employed. Ohm's law, which is one of the most fundamental principles in the science of electricity, states that in any circuit of constant form, in which a constant electromotive force is acting and a uniform current is flowing, the current, resistance and electromotive force are connected by simple mathematical relation, which may be expressed in the following manner: Let any two points in the circuit be selected, and let $R$ be the resistance included between these points, as expressed in ohms. Let $E$ be the electromotive force between these same points, as expressed in volts; and let $C$ be the current between them, in amperes. Then the relation in question is $C=\frac{E}{R}$, or $E=CR$. To apply this principle to the measurement of resistances, let $A$ and $B$, in Fig. 2, be the two points selected, and let the circuit be divided at these points, into the two branches $AHB$ and $AKB$; the resistance of $AH$ being $P$, while that of $HB$ is $Q$, that of $AK$ is $S$ and that of $KB$ is $T$. The points $H$ and $K$ are to be connected, later, by means of a conductor, $HGK$, carrying a galvanometer, $G$; but for the moment the conductor $HGK$ is assumed to be non-existent. Let us suppose that the difference in electromotive force between $A$ and $B$ is $E$, while that between $A$ and $H$ is $e$. Then Ohm's law, when applied to the branch $AHB$ as a whole, gives $E=C_1\ (P+Q)$; $C_1$ being the current flowing through the branch $AHB$. Similarly, when applied to the section extending simply from $A$ to $H$, Ohm's law gives $e=C_1P$. Eliminating $C_1$ from these two equations, we find that $e$, the electromotive force between the two points $A$ and $H$, is equal to $EP/(P+Q)$. In the same way we may show that the difference of electromotive force between $A$ and $K$ in the branch $AKB$ is equal to $ES/(S+T)$.

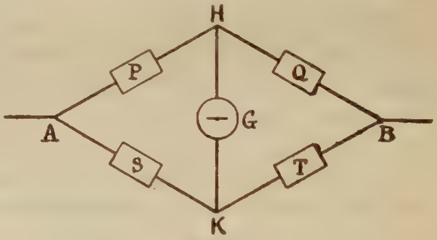

FIG. 2.

If the electromotive force between $H$ and $K$ is zero, then these two expressions are equal, and we have $P/(P+Q)=S/(S+T)$, which is equivalent to $Q/P=T/S$, or to $PT=QS$. If $H$ and $K$ are connected by a branch conductor that includes a delicate galvanometer, $G$, then the galvanometer will indicate a current except when the electromotive force between $H$ and $K$ is zero; that is, it will show a current whenever the relation $PT=QS$ is not fulfilled. This arrangement of branch circuits, with a galvanometer bridging across from one of the branches to the other, constitutes «Wheatstone's bridge.» Its use for measuring resistances may be illustrated as follows: Let $Q$ and $T$ be two known resistances, and let $P$ be the unknown resistance, whose value is to be determined. At $S$ we introduce a «resistance box,» which is merely a box containing an assortment of known resistances, so arranged that any or all of them can be conveniently thrown into the circuit or out of it. The resistance $S$ is varied by trial until the galvanometer $G$ ceases to show a deflection; and when this condition is fulfilled, we know that the equation $PT=QS$ holds true. But we knew $Q$ and $T$ to start with, and we have determined $S$ by trial; so that we know three of the four resistances that enter the foregoing equation, and we can, therefore, calculate the fourth. Resistances may be determined, in this manner, with exceeding accuracy. Consult for full details W. A. Price, 'Treatise on the Measurement of Electrical Resistance.'

Ohm's law enables us to foresee, very easily, how the cells of a given battery must be arranged, in order to obtain the greatest possible current through a given, fixed conductor by which its terminals are to be joined. If the zinc electrode of each cell is joined to the carbon electrode of the next one, so that the current has to pass through all the cells in succession, the battery is said to be arranged «in series.»

The quantity of energy dissipated in the form of heat when a current traverses a conducting circuit was investigated by Joule, and also by Lenz, Becquerel and others. It is found that the quantity of heat-energy set free in any given conductor in one second is proportional (1) to the resistance of the conductor, and (2) to the square of the current that is flowing. If the resistance of the conductor is $R$ ohms, and the current is $C$ amperes, then the quantity of heat generated in $T$ seconds will be $0.238\ C^2RT$ calories; the «calorie» being defined as the quantity of heat required to raise the temperature of one gramme of water from 14° C. to 15° C. This is «Joule's law.»

Allan D. Risteen, Ph.D.

**RESOLUTION ISLAND,** the name of several islands, the principal one being in British North America, at the extreme end of Hudson Strait; lat. 61° 39′ N.; long. 65° W. The island is about 40 miles in length and breadth, and Cape Resolution is on the east side. Resolution Island, in Dangerous Archipelago, Pacific Ocean, is in lat. 17° 22′ S., long. 141° 35′ W. Resolution, a lagoon island in Low Archipelago, is in lat. 17° 25′ S., long. 143° 24′ W.

**RESOLUTIONERS,** a designation of party which had its origin in Scotch Church history. When the Scotch with their covenanted king, Charles Stuart (Charles II), had been defeated by Cromwell at Dunbar (13 Sept. 1650), the Scotch Parliament repealed an act under which royalists were excluded from the army. The repealing act was approved by a large majority of the Scotch Kirk as being wise and politic in the circumstances, but it was reprobated by a small but zealous minority in the kirk as a betrayal of the true interests of religion; this party was known as that of the Protestors, the other party as that of the Resolutioners; each of the two maintained that it was itself the genuine Scotch Kirk, the only church that remained faithful to the Covenant and to the Church's head, Christ.

**RESOLUTIONS OF '98,** the designation commonly given to the Kentucky and Virginia resolutions of 1798, defining the relations between the State and Federal governments, and protesting against certain acts of Congress as unconstitutional, and as violating the rights reserved to the States. The Resolutions offered in the Kentucky legislature, and adopted by that body, were drafted by Thomas Jefferson, who, in common with other leading American statesmen, and the majority of the people, was alarmed by the enactment of the Alien and Sedition Laws, and other measures regarded as indicating a purpose to create a centralized despotism in place of the Union formed under the Constitution.

The first Resolution declared that the Federal Constitution was a compact between the States, by which a general government was created for special purposes, and that, «as in other cases of compact between the parties having no common judge, each party has an equal right to judge for itself, as well of infractions as of the mode and measure of redress.» The Alien and Sedition and other laws were pronounced «not law, but altogether void and of no force,» and one of the Resolutions postponed to «a time of greater tranquillity» the «revisal and correction» of other acts of Congress alleged to be unconstitutional.

The eighth Resolution directed the appointment of a committee of correspondence, to communicate the Resolutions to the several States, and to inform them that the State of Kentucky was determined «to submit to undelegated and consequently unlimited powers in no man or body of men on earth; that in the case of an abuse of the delegated powers, the members of the general government being chosen by the people, a change by the people would be the constitutional remedy; but when powers are assumed which have not been delegated, a nullification of the act is the right remedy; and that every State has a natural right, in cases not within the compact, to nullify of their own authority all assumptions of power by others within their limits.» The Committee of Correspondence was instructed to request the other States «to concur in declaring those acts void and of no force, and each to take measures of his own for providing that neither these acts, nor any other of the general government, not plainly and intentionally authorized by the Constitution, shall be exercised within their respective territories.»

The Resolutions passed the Kentucky legislature, 14 Nov. 1798, with only two or three dissenting votes, and similar Resolutions, drafted by James Madison, were adopted by the Virginia legislature, 24 Dec. 1798, by a vote of 100 to 63 in the house of delegates, and 14 to 3 in the senate. The fact that both Jefferson and Madison were afterward elected Presidents of the United States, and that the Democratic party, which they represented, remained in power for many years, has been accepted as indicating that the Kentucky and Virginia Resolutions had the substantial approval of the American people. See UNITED STATES.

**RESONANCE,** the reduplication or echoing of sound, increasing its volume so that it may be regarded as strengthened. When a person speaks in an empty room the walls reflect the vibration. There is an echo from each wall, but it returns so quickly that we do not recognize it as an echo; and whether or not the listener is equidistant from the different reflecting surfaces, the echoes give the effect of strengthening the sound or increasing its volume. This resonance occurs when a sounding-board is used to strengthen the vibration from a string or a tuning-fork. Resonance is also observed when a sound is made in a large open-mouthed vessel. The form of the bell is designed to gain the benefit of this resonance. A piece of flat metal, the size of a bell, would not produce nearly the same effect, when struck by a hammer, as does the bell, whose sides reflect the vibrations. The principal of resonance applies to all waves, and is observed in electrical phenomena and radiography.

**RESORCINOL, RESORCIN,** 1:3 dihydroxy benzene, $C_6H_4(OH)_2$, is formed by the fusion of certain resins or gums with caustic alkalis. Aromatic compounds containing two side chains, e.g., benzene chlorsulphonic acids, benzene disulphonic acids and halogen phenols, will also yield resorcin when fused with caustic alkalis. On a commercial scale resorcin is prepared by gradually heating a mixture of dry meta sodium benzene disulphonate and caustic soda. The mass is stirred during fusion, and the temperature is not allowed to go above 275° C. The product is treated with much water, acidified with hydrochloric acid, extracted with ether or benzene and finally purified by distillation and recrystallization from benzene.

Resorcin is a colorless, crystalline compound, with a melting point of 118° C., and a boiling point of 276.5° C. It is somewhat volatile with steam and dissolves readily in water, alcohol, ether and glycerine. Its aqueous solution reacts with bromine water to give a precipitate of tribromresorcin. On exposure to light and air it acquires a brown tint, due probably to the presence of moisture and traces of iron.

Resorcin is extensively employed in the manufacture of synthetic dyes. Heated with phthalic anhydride and a dehydrating agent it condenses into fluoresceïn, and from the latter may be obtained eosine, erythrosine, spirit eosine, eosine S, eosine BN, erythrosine G, spirit cyansosine, rose bengal, oriental yellow, etc. With phthalic anhydride, in the presence of benzyl chloride and sulphuric acid, resorcin condenses into chrysoline — the important silk dye. With diazoxylene and diazosulphanilic acid it forms resorcin brown. Resorcin is also employed for the preparation of tropaeoline O, isodiphenyl black, lacmoid, Hessian brown BB, Kongo brown G, fast green O, Iris blue, Sudan G, etc.

On account of its antiseptic properties resorcin in water solution has been recommended as a wash for diseased stomachs, in the treatment of skin diseases, in hay fever, nasal catarrh, chronic eczema and intestinal catarrh; but recent experimenters claim that the employment of resorcin in large doses will usually develop symptoms similar to those of alcoholic poisoning.

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**RESPIRATION.** The essential process in respiration is the taking in of oxygen and the giving out of carbon dioxide by the living cells of a plant or animal. In higher animals special organs, the lungs (q.v.), and a special tissue, the blood (q.v.), are the main factors in this exchange; but in the lower animals various types of structures are utilized. Thus in insects there are series of ramifying tubes into which the air circulates; in water animals there are gills, which are the precursors of lungs in land animals. Even those higher animals in which the major part of the oxygen exchange takes place in the lungs (external respiration), there is also an internal respiration constantly taking place in the exchange between the blood, the lymph and other tissues. Respiration in plants is of the same general character as in animals. It is not to be confounded with the much more active process of photosynthesis, by which plants utilize carbon dioxide and give off oxygen, a process which was termed respiration by the older plant physiologists.

**Historical Summary.**—The earliest naturalists and philosophers, Aristotle and others, even down to the anatomists of the 15th century, taught that the function of respiration was to draw air into the arteries and heart, and thus to cool the blood. The old Galenic doctrine was that the «air introduced by breathing served to regulate, to maintain and at the same time to temper, to refrigerate the innate heat of the heart.» Again the pumping action of the thorax introduced into the blood the air which was necessary to generate the vital spirits in the left side of the heart, and finally the same pumping action got rid of the foul vapors, the product of the innate fire burning in the heart. Harvey was one of the first to show that the same channel probably did not serve to carry these two different currents. But the chemical problems involved were too intricate for Harvey, although it was chiefly through the work of a group of Englishmen of the 17th century that the unraveling of the mystery of respiration came about. Von Helmont had taught a theory of fermentations, and he had noted the difference in color in blood passing through the lungs. Borelli approached the mechanical side of the problem and showed the truth regarding the mechanics of the chest, the bellows-like action of which took in by atmospheric pressure and expelled the air by the muscular relaxation and the elasticity of the chest-walls. Malpighi had in the meantime discovered, with the aid of his crude microscopes, the minute structure of the lung, and Borelli, as well as others (Hooke, 1667; Croon and Boyle, 1666), working with the newly-discovered principle of the air-pump and vacuum, had learned that air was absolutely essential to the life of the animal, and had advanced to the point that the particles of the air taken into the lungs enter into and become mixed with the blood. But Borelli was a physicist, and had no sympathy with the new chemical learning, which was then a very vague subject. Hooks and Lower made the next steps possible, the former by his artificial-respiration experiments, proving the necessity for air, and the latter by his careful transfusion experiments, demonstrating that the difference between dark venous blood and lighter arterial blood was due to the admixture of air, thus explaining this color change, which had been recorded for thousands of years and referred to thousands of causes. Up to this time it had always been thought that the air was a simple substance, and not a mixture. John Mayow (1643) first showed that not all of the air was used by the lungs in influencing the blood, but only a certain part; and although he called it by a different name (spiritus nitro-aerius), it was that part now known as oxygen. Mayow thus developed the first full adequate physico-chemical theory of respiration. He saw that respiration was a process analogous to combustion, and that the movements were to take in the nitro-aerial gas and give out the vapors arising from the blood. But he did not know at all what these vapors were. He had grasped at the meaning of the intake, but had no knowledge of the exchange products. He said: «In the first place then, I take it for granted that the air contains certain particles termed by us elsewhere nitro-aerial which are absolutely indispensable for the production of fire, and that these in the burning of flame are drawn from the air and removed, so that the latter when deprived of these particles ceases to be fit for supporting fire.» «With respect, then, to the use of respiration, it may be affirmed that an aerial something, whatever it may be, essential to life passes into the mass of the blood. And thus air driven out of the lungs, these vital particles having been drained from it, is no longer fit for breathing again.» This and other wonderful discoveries were made by a young man of 25, and who died at the age of 34. Mayow's work was then forgotten for almost 100 years. As Foster expresses it, «that which in the first years of the latter half of the 17th century as igneo-aerial particles shone out in a flash and then died away again into darkness, in the last years of the 18th century, as oxygen, lit a light which has burned, and which has lighted the world with increasing steadiness up to the present day.» The names of Stahl, Haller, Boerhaave appear as keeping alive the study of respiration. Stephen Hales, an active parish priest, and the earliest sanitarian, was an ardent student of chemistry. He first enunciated the principle of free and combined gases, and led the way to the work of Joseph Black, who rediscovered Von Helmont's «fixed air,» which was given off by the lungs, and that animals placed in the «fixed air» died much as if they were deprived of fresh air. The next step was made by Priestley, who in 1772 rediscovered Mayow's «igneo-aerial» spirit and isolated oxygen. Priestley's views, however, were permeated by the century-old phlogiston theory, and it remained for Lavoisier clearly to demonstrate what oxygen really was and to overthrow the phlogiston theory. Thus the problem of animal respiration was solved. The air, composed mostly of innocuous nitrogen and of small proportions of active oxygen, passes into fine air vesicles, first seen by Malpighi, the blood there takes up the free oxygen, giving off carbon dioxide, which exchange constitutes the essential feature of respiration. It should be added that it was not until Gustavus Magnus (1837) proved the presence of the blood-gases in different proportions in the blood that the present theory of respiration assumed a definite form. The study of the relation of the iron of the hæmoglobin in the blood to this oxygen exchange constitutes the last chapter in the unraveling of this secret of nature.

**Mechanics of Respiration.**— Breathing consists in the rhythmical expansion and contraction of the walls of the chest, by means of which process air passes into the lungs and thus comes in contact with the blood. The lung structure itself possesses no marked expansile power, but it is in a constant state of tension, there being negative pressure in the pleural cavity. The muscles attached to the ribs, including the diaphragm (q.v.), expand the cavity of the chest in all three diameters by raising the ribs and lowering the diaphragm; the air rushes in and inflates the lungs; the muscles then relax, the elasticity of the ribs causes the chest-wall to contract, the lungs themselves contract somewhat and the air is forced out through the bronchi and larynx. Thus it is evident that lungs themselves are merely passive agents in inspiration, being filled and emptied of air largely in consequence of the movement of the chest-wall. The control of the muscular movements is partly voluntary and partly involuntary, and the breathing centre so called is in reality a complex one, or rather a series of centres, all co-ordinated. Thus the motor centres for certain muscles attached to the ribs are located in the spinal cord, and their excitation can bring about restricted movements of expansion, while their destruction may result in paralysis of certain of the muscles of respiration. Another breathing centre, the most important one, spoken of as the automatic or true respiratory centre, is found in certain ganglion cells in the floor of the fourth ventricle of the medulla oblongata (q.v.). This is the vagus respiratory muscles. Their destruction destroys the co-ordination of the muscular movements and brings about death. A third centre is present in some portion of the fore brain, probably in the frontal lobes. It is the centre that enables one to «hold the breath,» or to make extra deep breaths, etc. The distinction between conscious and unconscious breathing is very distinct and yet very subtle. Voluntary influences constantly modify the rate of breathing. While one is asleep these conscious influences are usually temporarily excluded, and then the so-called normal rhythm is seen. This is usually from 18 to 20 to the minute in the adult, the ratio of length of inspiration to that of expiration being about 10 to 12. Numerous individual variations may be present, however, the rate varying from infancy to old age, and in diseased conditions the rate is nearly always modified, usually quickened in consequence of the increased oxidation that often accompanies disease. Occasionally respiration is slowed when there is painful breathing, or some form of poisoning; opium-poisoning is a noted illustration. In this condition the breathing rhythm may sink as low as four to five to the minute. In children of both sexes the movements of breathing are similar, but as adult conditions develop, and changes in dress become pronounced, it happens that women are more apt to breathe more in the chest (costal breathing), while men make more use of the lower ribs and the diaphragm (diaphragmatic or abdominal breathing). The amount of air taken into the lungs varies widely with the size of the individual, the shape of his chest and a number of other factors that make it impossible to give a general average. It is usual to measure that portion of air that passes in and out of the lungs during normal respiration as tidal air; this has been known to be from 150 to 700 cubic centimeters. In forced breathing a certain extra amount of complemental air can be taken into the chest, its average being about 1,500 cubic centimeters. A certain amount of air (residual air) cannot be expelled from the chest even by forced expiration. This has been found to vary in amount from 400 to 1,500 cubic centimeters. The vital capacity, or the amount of air which can be expelled from the thorax by forced expiration following a deep inspiration — a spirometer, or the «lung-tester» of the circus, being the instrument for measuring the same — varies very widely according to practice, height, weight and age. For the comparative anatomy of respiration, see ANATOMY, COMPARATIVE, *Respiratory System.*

**Artificial Respiration.**— When death is imminent, owing to a cessation of the natural respiration movements, it may sometimes be averted by an imitation of them carried on regularly for a while. Such a condition may occur in disease (for example, asthma, epilepsy), though very rarely; it is most common in suffocation, either by drowning, choking or strangulation, and is sometimes met with also in poisoning by noxious vapors (for example, carbonic acid, carbonic oxide, coal-gas, chloroform, etc.). In order that any method may have a chance of being successful it is of course necessary that the entrance of air into the lungs be not impeded, whether by a piece of food or by water in the windpipe or by the tongue falling back and closing the upper opening. A piece of food may sometimes be removed through the mouth by the finger; if this fails, the windpipe should be opened. In those apparently drowned the body should first be laid on the face, with the head low, and the thorax and abdomen be pressed on in order to expel fluids which may have been drawn into the trachea and bronchial tubes. The tongue may need to be held forward; this may be done by an assistant, or an elastic band passed round the tongue and the chin will effect the object. No general consensus of opinion has yet been arrived at as to which is the best method of producing artificial respiration. The methods most employed fall into three divisions: (1) insufflation, or blowing of air into the lungs, either by the mouth or by means of bellows; (2) manual methods, in which external manipulations of the chest-walls are made to effect the entrance and exit of air; (3) electrical stimulation of the respiratory muscles. In all cases where artificial respiration is required every movement is of importance. It is doubtful whether life can ever be restored when the heart has ceased to beat for more than a few seconds; and when breathing has stopped failure of the heart's action is always imminent. That method is, therefore, best which can be applied with the least possible loss of time, so that under ordinary circumstances the methods which require bellows or electric batteries are out of the question. Direct insufflation, or blowing of air into the patient's lungs by the mouth applied to his mouth, is now hardly ever used except in the case of very young children, although within recent years specially devised pumps have been made that are at times very serviceable. Of the manual methods those most in use are Marshall Hall's (1856), Silvester's (1857) and Howard's (1877). The second is certainly the most easy to learn, but is more fatiguing to carry out for a length of time than either of the others. In Marshall Hall's method the body is laid upon its face and rolled «in what may be termed cradle-fashion» from this position on to one side and a little beyond it (inspiration), and then back on to the face (expiration). In Silvester's method the patient is laid on his back on a plane, inclined a little from the feet upward, and the shoulders are gently raised by a firm cushion placed under them, which also throws the head back. The operator then grasps the patient's arms just above the elbows and raises them till they nearly meet above the head. This action imitates inspiration. The patient's arms are then turned down and firmly pressed for a moment against the sides of the chest. A deep expiration is thus imitated. In Howard's method the patient is laid on his back with a cushion below the middle. The operator kneels astride his hips, places his hands with fingers spread outward over the lower part of the chest-wall and alternately bends forward, throwing his weight on the chest to imitate expiration, and springs back to allow the elastic recoil of the chest-wall to imitate inspiration.

Whatever method be adopted, the movements must be gentle, regular and perseveringly carried out, at the rate of from 10 to 15 times in the minute; and when the faintest natural effort at respiration is observed they must at once be timed so as to reinforce and not to oppose it. In some cases life has been restored under artificial respiration when no respiratory movements have occurred for an hour or even several hours. In all cases, but especially in that of persons apparently drowned, artificial respiration should be conducted in a warm atmosphere, 90° F., or even more if possible, and should be supplemented by warmth applied to the body and by vigorous friction. In those apparently drowned recovery is very rare after complete immersion for as much as five minutes. If stunning or fainting has occurred at the moment of immersion, so that the respiratory movements have been annulled or much diminished for the time, less water will have entered the lungs, and the chance of recovery may be greater. In other modes of death by suffocation, such as choking or strangulation, the action of the heart may continue longer, and restoration to life be, therefore, possible after a longer deprivation of air. In recent years a variety of instruments, pulmometers, have been constructed to do the work of artificial respiration. These are widely used in industrial asphyxiation from fires, etc. See ANATOMY; ASPHYXIA; DROWNING; HEMOGLOBIN; LUNGS.

Consult Bert, ‹Leçons sur la Physiologie comp. de la Respiration› (1870); Foster, ‹Lectures on the History of Physiology› (1901); Bayliss, ‹General Physiology› (2d ed., 1918).

SMITH ELY JELLIFFE,
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**RESPIRATION CALORIMETER.** See CALORIMETER, RESPIRATION.

**RESPIRATION IN PLANTS.** See PLANTS, RESPIRATION IN.

**RESPIRATOR,** a contrivance used as a mouth-covering to protect the wearers from noxious vapors, coal-dust, mine-gas, etc. They are also frequently employed to secure the inhalation of a medicated atmosphere, containing a layer of lint or wool on which a few drops of terebene, eucalyptol or other antiseptic are placed.

**RESPONDENT,** (1) *in equity,* one who answers a bill. In this sense it is equivalent to the term defendant as used at common law. (2) *In admiralty,* one who answers a libel. (3) One who opposes an appeal; an appellee. (4) *In English law,* one who defends a suit for divorce. (5) *In civil law,* one who acts as security for another.

**REST-CURE,** a method of treatment advocated by Dr. W. S. Weir Mitchell in 1875 for cases of nervous prostration and various conditions characterized by poor blood and lack of muscular and nervous tone. It is a systematic treatment extending over several weeks, a combination of absolute rest of body and mind, regular diet at fixed hours, a separation from relatives and friends, passive exercise by massage, the use of electricity and the supervision of a trained nurse. The use of medicines is of secondary importance, but frequently of value. As Dr. Mitchell puts it, the rest-cure is of service to «invalids, unable to attend to the duties of life, and sources alike of discomfort to themselves and anxiety to others.» Many modifications have been introduced in the system to adapt it to sufferers from alcoholism, indigestion, tuberculosis, etc. Consult Mitchell, S. Weir, ‹Fat and Blood› (new ed., Philadelphia 1905); Dercum, F. X., ‹The Rest Cure› (in ‹Modern Treatment,› Philadelphia 1910).

**RESTIF DE LA BRETONNE, Nicolas Edmé,** French novelist and reformer: b. Sacy, 1734: d. 1806. Bretonne, though unknown to the general public, holds a remarkable place in French literature. The son of a farmer, he was educated by the Jansenists, and on their expulsion from France became a printer, and later went to Paris. He married Agnes Le Buges. Six or seven years after his marriage he began to write, and until his death poured out a stream of books, amounting in all to about 200. They were upon almost every kind of subject, and many were written in the wildest vein of license, both of speech and morals. Many of his books he printed himself and to-day the original editions are very rare. It is impossible to mention his works in detail, because of the fact that they are so numerous and also because of the subject matter. Perhaps the best known of his novels is ‹Le paysan perverti› (1777), a novel that had back of it a moral purpose, though written in a very immoral manner. Bretonne's ‹Les Contemporaines› (42 vols., 1780–85) is a great collection of short stories, dealing with marriage, love and intrigue. ‹La pornographe› (1769) was a plan to regulate prostitution, and the plan was tried in one of the German cities of the time. Perhaps the most important of his works was his remarkable autobiography, ‹Monsieur Nicolas,› published in 16 volumes. This extraordinary work, which is one of the strangest pieces of literature in the world, presented his life story and his views upon society, morals and also his numerous love episodes. It ranks but little below ‹Cassanova,› to which it is often compared. In 1795 Bretonne received a pension of 2,000 francs from the French government, and just before his death he was given a place in the Ministry of Police, which he did not live to fill. His other works are all filled with the same frankness of expression. Among them might be mentioned ‹Anti Justine›; ‹Filles du Palois Royal›; ‹Le nouvel Abailard›; ‹Le pied de Fanchette.› Though for some time Bretonne was considered simply as a pornographic writer, and was nick-named the «Rousseau du ruisseau —Rousseau of the gutter,» to-day his works are considered valuable studies of the life of his time. It should be understood that Bretonne, though the author of many books, has not been translated in English, and there seems to be no reason for thinking that any of his works ever will be. There are numerous editions of his most important novels in French, and ‹Monsieur Nicolas› has been translated into Italian and German. Consult Duhren, Eugene, ‹Restif De la Bretonné› (Berlin 1906); Monsilet, C., ‹Restif De la Bretonne› (Paris 1853). The best edition of ‹Monsieur Nicolas,› Bretonne's leading work, is that published by Liseux (14 vols., Paris 1883–84).

**RESTIGOUCHE,** rĕs-tĭ-goosh′, a river of Canada, in its lower course separating New Brunswick from the province of Quebec, and flowing northeast into the Bay of Chaleur at Dalhousie. It rises in eastern Quebec, is 225 miles long, is navigable for 16 miles to Campbellton and forms a tidal estuary for 24 miles. It drains 6,000 square miles and its basin supplies great quantities of timber.

**RESTITUTIONISTS,** a Christian religious sect in New England whose distinguishing tenet is that the restoration of mankind to the condition from which he lapsed through Adam's sin of disobedience is near at hand, and that the reign of perfect love, justice, purity and holiness is soon to commence. They observe the Sabbath of the Hebrews as a holy day of rest and assemble weekly for worship on the evening (Friday) before the Sabbath.

**RESTORATION,** in matters of fine art, the putting of a building, a work of sculpture, a painting or other work of art into what is thought to have been its original perfect condition. There is, however, a secondary meaning which is often used in a way to cause confusion: this is the preparation of drawings showing what, in the opinion of the draftsman or his director, would be the appearance of the building or other work of art if restored according to the above definition. The term «conjectural restoration» is applied to these drawings, though all restoration is more or less conjectural, but the adjective is used in these cases because the drawings often represent much more complete and precise, and much less thoroughly verified statements concerning the original state of the work of art than those which are actually carried out.

To treat first of these suggestions for restoration embodied in drawings: Among the most useful in the way of architecture are some by Sibil, who continued the work of Letarouilly in his folio work on the Vatican in Rome, and those by the well-known author and architect, Viollet-le-Duc, especially in the plates to ‘Entretiens sur l'Architecture,’ and in three or four large lithographs for display on the walls of schools and the like. These are based upon a very exact knowledge of the processes of building. There are some of singular interest in the work on the discoveries at Pergamon, by Pontremoli and Collignon (‘Pergame,’ Paris 1900); in the kindred work on ‘Epidauros’ by Defrasse and Lechat, Paris 1895; also in a three-volume book called ‘La Restauration d'Olympie’ by Laloux and Monceaux. In such drawings a building will be shown complete and in use, with figures near it and passing up and down its flights of steps, or seated on its stone benches. Life is given to the representation by landscapes fitted to the purpose, or by other carefully considered surroundings. In connection with these there should be mentioned also the models in plaster, the preparation of which is a serious art in Paris and in other great centres of artistic study. These models, when concerned with a non-existent building, may be a complete rendering of that building, as in the case of the model of the Parthenon and that that of the Hypostyle Hall at Karnak, both at the Metropolitan Museum of Art, New York. (See ARCHITECTURE; EGYPTIAN ARCHITECTURE). In these there has been a bold attempt to show, as if definitely known, the entirely uncertain structure of the roof of the great temple, and also the painting on the same building, according to the theory of the accomplished architect who designed the model, the late Charles Chipiez: but the Egyptian temple has its paintings modified on account of modern notions of propriety. The model of the Pantheon at Rome, in the same collection, can be visited both within and without, and is more nearly trustworthy than that of the Parthenon. Of the same nature are the fine Scheck models of the temples of Solomon and of Herod (see JERUSALEM). All of this, however, is conjectural restoration of excellent quality.

Restoration of buildings, when carried out in reality, is extremely open to error of the most mischievous sort, because it is never safe to assume that the last word has been spoken in the matter of demonstration of the building's original condition. As the years advance, for instance in 1920, we could not for a moment accept the archæological knowledge of our predecessors, say of 1860, and yet in the years following the middle of the 19th century nearly all the most important mediæval buildings of Europe were restored, and too often in a radical way. In too many cases the original character of the building is destroyed altogether, as in the famous instance of the church of Saint Front at Périgueux, and in the case of the Fondaco dei Turchi at Venice, now the Museo Civico; but in a vastly greater number of cases the restoration has been conscientious and in a way judicious, but has still destroyed much that would be, had it been spared, the best possible evidence for the original study of the structure. It will be noted that the ambition of the official or committee in charge of a great building, religious or secular, is nearly always to have it as complete and elegant as may be; that this ambition is more than repeated in the architect whose reputation and pecuniary gain are closely connected with the great and costly undertaking; and finally that these ambitions find an echo in the opinions of the general public, who, of course, like to see the famous monument of their city put into first-rate order and kept as clean and perfect and bright-colored as the new buildings near. To this is added the actual demand for safety. Thus, in the case of the Ducal Palace at Venice, of which the restorations were carried on between 1881 and 1884, a conscientious desire to preserve the famous building intact was present in the mind of the controlling intelligence; but the great capitals of the lowermost arcade upon which the whole weight of wall reposes were in many cases found to be so split that they were unsafe. It may well have been thought with perfect honesty that the preservation of the building required their removal; they were removed and placed with all care in a hall of the building, while newly cut capitals were put in their place. Saint Mark's was more harshly treated, for the exquisite marbles with which the exterior was sheathed were carried off and replaced by slabs of a vastly inferior quality and color, a certain smoothness and a certain appearance of finish being thus obtained at the expense of the chromatic beauty of the original work. Nothing need be said of the mosaics, because they are always in a state of change, repairs and restorations going on all the time: but the change in the great floor of the church by which the singular waves and hollows which had marked it for so many years were all graded and the floor smoothed out into a glossy, modern pavement, excited at the time the greatest indignation on the part of many, but can hardly call for criticism, there being so much doubt as to the true cause of the old inequalities.

There is still another difficulty in the restoration of buildings, namely, the introduction of later, though still early, details. Thus in a Gothic cathedral, especially in England, one whole bay of the north or south aisle will have been built up with 14th century windows, contrasting oddly with the «early English» fenestration of the neighboring bays. Shall the restorer respect these changes of an earlier time, or shall he sweep them all away and make the church that which, according to his best lights, it was in (say) 1195? It is evident that there is great room for disagreement as to this, and that no restoration of such building can ever satisfy the student altogether. It is evident that every precaution should be taken to save the old work and that the interests of fine art and archæology alike demand the preservation of every bit and scrap of building as it has reached us from antiquity, repairs being carried out only in so far as to save the ancient pile with all its details. At the same time excuses can readily be found for those who advocate a sweeping restoration: for, as they would say, the building was meant to be used and was meant to have a certain general aspect: is it not probable that we know enough to put it back to its original character? Unbelieving critics can never persuade these people of their own probable ignorance.

In sculpture the case is more simple. Until within the last 25 years an important antique statue was generally restored, and the most skilfully carried out restoration was perhaps that of the Ægina sculptures in the Glyptothek in Munich. These are said to have been directed by the celebrated sculptor Bertel Thorwaldsen, and they have a wonderful appearance of verity, while at the same time no one can say how far the surface of the marbles found in Ægina have been lowered in places to agree with the restoration. It has always been considered a wonderful piece of good fortune at a time too early for such intelligence in archæological matters — the preservation from restorations of the Venus of Milo in the Louvre, this preservation having been largely the result of disagreement. On the other hand, the finds of the years since 1870 are much more commonly preserved intact; no one will think of restoring the Hermes of Olympia. Even in our own time, however, such slight injuries as the breaking of two or three fingers in the Augustus of Otricoli in the Vatican, or in the Venus of the Capitol, are pretty certain to be repaired, but then it is the custom of all properly managed museums that a label shall hang on the pedestal with a full description of the additions made, and the catalogues of the better organized museums contain also such a mention in full.

In the matter of painting it has long been understood that there is only one safe way and that is to refrain from bringing a brushful of paint anywhere near the canvas. The old picture has suffered certain injuries; it must not, therefore, be subjected to the greater injury of falsification. As late as 1885 paintings in several of the museums of Europe were undergoing repainting of the most radical sort. Any person who was looking into the matter at that time would miss from its place in a church or gallery some great canvas. If he were shrewd and bold he would get sight of that canvas set up against a wall on its side or on its head perhaps, and there undergoing a process of repainting in sky or drapery at the hands of the most unintelligent operative who could use a palette and a painter's pencil. By and by the picture would be in its old place again and then the few who look closely into a picture would feel that their old friend and inspirer was gone. The director of just such a restoration said to the writer that he was quite aware of the opinion of the foreign visitors that this ought not to be done — that only a patch of neutral color should be put in where an actual blister had existed — where color had left the canvas altogether — that, in short, the picture should be mended, but not repaired and renewed with an attempt to imitate its original surface. He was a good-tempered old gentleman and made no pretense at artistic pride in his work, which indeed was going on at the hands of the most forlorn and careless copyists, but it was his work, for which his salary was paid. It was suggested long ago that every picture in a public gallery should have hung on its frame an exact account of what had been done to it and when — whether partial repainting or repairing of positive injuries, revarnishing, transferring from wood to canvas or the like. This, however, has not been done as yet, and the student of the most precious paintings in the world is grievously handicapped by the primary difficulty of discovering what is really the artist's work and what is the ignorant tinkering of irresponsible moderns. Consult Holyoake, M. L., ‹Restoration of Paintings› (in *Magazine of Art* London 1900); Secco-Suardo, ‹Ilrestauratore del depinti› (Milan 1894).

RUSSELL STURGIS.

**RESTORATION, The,** in English history a term applied to the accession of King Charles II, in 1660, after the civil war, to the throne of England, after an interregnum of 11 years and 4 months, from 30 Jan. 1649 (when Charles I was beheaded) to 29 May 1660. In French history, the first restoration begins 3 May 1814, when Louis XVIII made his entry into Paris under the protection of foreign bayonets and ended with the return of Napoleon from Elba, 20 March 1815. The beginning of the second restoration is generally reckoned from the battle of Waterloo, 18 June 1815, and terminated on 29 July 1830, with the abdication of Charles X.

**RESTORATIONISTS,** the followers of Origen in the opinion that after a certain purgation proportionate to their delinquencies all will be restored to God's favor and to paradise. In the Middle Ages, the Brethren of the Free Spirit held this doctrine; at the time of the Reformation, it was taught by the Anabaptists and in the 18th century by the Rationalists. See also UNIVERSALISM.

**RESTRAINT OF MARRIAGE,** that which unreasonably represses or restricts marriage, as a clause in a will forbidding under penalty the marriage of an unmarried person. Such a condition, if general, is void. A condition in restraint of a second marriage is held to be legal. Likewise a condition which restrains marriage with a particular class is legal. It has been held that the limitation of a bequest or an annuity to continue until a woman shall marry is legal both in the United States and in Great Britain. Similarly a condition in restraint of marriage is legal if a condition precedent.

**RESTRAINT OF TRADE,** that which tends unreasonably to restrict or prevent trade. By common law a contract which deprives a person of the right freely to engage in lawful business is void as contrary to public policy. However, contracts which are in partial restraint of trade, for a valuable consideration and which are a reasonable protection to a contracting party are legal. For instance, an agreement by A with B never to carry on business again or not to carry it on for 100 years at any place would be void, but an agreement by A with B not to carry on a business in the same town with B for 10 years would be reasonable and, therefore, valid. The tendency of the law in the United States and that of Great Britain are similar, but there are minor differences. Interstate and international commerce in the United States became subject to the provisions of the Sherman Act in 1890. In effect, this statute declares that old contracts, combinations, etc., in restraint of interstate or international commerce are void. It subjects to a penalty all persons found guilty of such acts and provides for forfeiture of goods in transportation in violation of the act by the government and dissolution of such contracts. Formerly it was held by the Supreme Court of the United States that all such restraints of trade, whether reasonable or unreasonable, violated the statute, but in later decisions this rule was modified by the adoption of the so-called «rule of reason,» which practically follows the old decisions that no restraint is void which is reasonable. Various States have passed laws punishing restraint of trade, notably Kansas, Ohio, Missouri and Texas. It has been suggested, as an aid to Federal enforcement of laws punishing restraint of trade, that all industrial concerns doing an interstate business be compelled to incorporate under Federal laws, but this would probably require a constitutional amendment and is, therefore, impracticable.

**RESTRÉPO**, rā-strā'pō, **Carlos E.**, Colombian statesman: b. Medellín, 1868. He received an excellent education and engaged in the practice of law, taking an active interest in politics. He served in the House of Representatives, acting as its presiding officer, and in 1910 was elected President of the republic. At the time of his election to succeed Gen. González Valencia there was a strong anti-American feeling at Bogotá and an American-owned railroad was obliged to suspend service. In the following year the United States consul, W. B. MacMaster, died under suspicious circumstances. Restrépo, although originally anti-American, changed his policy and labored earnestly to bring about a better understanding between the two countries. His administration was notably prosperous.

**RESTRÉPO, José Manuel**, Colombian historian and statesman: b. Envigado, 1780; d. 1 April 1864. He early gained a literary reputation and in 1810 espoused the cause of independence. He was a member of the Congress of Cúcuta and became Foreign Secretary in the newly-established government. He was afterward intimately associated with Bolívar, serving for a time as his secretary. His history of the revolution is highly valuable, much of his information being secured through personal observation. It was published ‘Historia de la revolución de Colombia’ (1827).

**RESUMPTION**, the return to specie payment by a government. The Resumption Act of 14 Jan. 1875 fixed 1 Jan. 1879 as the day on which specie payments should be resumed by the United States government. Resumption actually took place on 17 Dec. 1878, when the premium on gold disappeared.

**RESURRECTION**, generally spoken of as *resurrection of the dead*, or *of the body* (*resurrectio mortuorum*, *resurrectio carnis*, *ἀνάστασις τῶν νεκρῶν*) is the doctrine of the reunion of the soul and body of man after their separation in death. This teaching of revealed religion should be distinguished from that of the immortality of the soul, and the eternal survival of human personality after death. (See IMMORTALITY). Moreover, the miraculous resuscitation of the dead,— by the intercession of the prophets of the Old Law and the apostles of the New, or by the Divine power of Jesus Christ,— does not enter within the scope of the belief in a general resurrection. After summing up the traces of the resurrection-belief as they are found in paganism, this article will give the biblical, ecclesiastical and patristic evidence in favor of the revealed truth of a future resurrection; and will then establish the fundamental fact of Christianity, the resurrection of Christ.

**I. Pagan Traces.**— In pagan religions, degenerated from God's primitive revelation to the human race, there is a common and definite belief in the survival of human personality after death; but the traces of a hope of a future resurrection are not universal nor distinct. Many savage tribes witness to a crude belief in metempsychosis. Such theories of reincarnation and transmigration of souls may readily be distortions of a primitive revelation of the resurrection of the body. The totemistic worship of the bear, the beaver, etc., which is found among the Sioux, Iroquois and other American Indians, follows upon the idea that the souls of the tribal ancestors have been reincarnated in those animals. Among the Egyptians, reincarnation was a purification of the soul and a preparation for final and separate existence. Consult Budge, ‘The Egyptian Heaven and Hell’ (1905); ‘The Book of the Opening of the Mouth’ (1900); ‘The Liturgy of Funerary Offerings’ (1909); ‘The Book of the Dead’; Garstang, ‘Burial Customs of Ancient Egypt’ (1907). To the Babylonians the idea of resurrection is familiar. It is supposed in the worship of Tammuz. Consult *Hymn to Tammuz* (in Rogers, ‘Cuneiform Parallels to the Old Testament,’ 1912, p. 179). In the «Descent of Ishtar,» Tammuz and Ishtar return alive from the abode of the dead. (Dhorme, ‘Choix de textes religieux Assyro-Babyloniens’ 1907, p. 326; Lenormant, ‘Mélanges d'archéologie égyptienne at assyrienne,’ Vol. I, pp. 31–35). Marduk and other gods are accredited with the power to raise men from the dead (Jeremias, ‘Babylonisch-Assyrischen Vorstellungen vom Leben nach dem Tode,’ 1889, p. 100). In the henotheism of Marduk he is invoked as «he that giveth life to the dead» (Jensen, ‘Die Kosmologie der Babylonier,’ 1890, p. 196; Martin, ‘Textes religieux assyriens et babyloniens,’ 1903, p. 217; Lagrange, ‘Etudes sur les religions sémitiques’ 1905, p. 340). Persian religion has its resurrection of the dead; but the Avesta, containing this doctrine, was not closed until the 3d century of the Christian era. (Lagrange, ‘La religion des Perses,’ 1904, pp. 33–35). In India the idea of metempsychosis is essential to religious thought. Each Buddhistic *Karma*, or successive life, depends upon the perfection of the soul's preceding incarnation; and this cycle of existences leads up to *Nirvana*, a cessation of conscious existence, or annihilation of personality by absorption in the Buddhistic Absolute. Mohammedanism borrows and deteriorates resurrection-ideas of Hebrew and Christian revelation.

**II. Old Testament Teaching.— 1. Genesis.** The human race, at its creation, was endowed with the preternatural gift of immortality. At the dawn of human life, the separation of soul from body in death was precluded by God's special providence. The tree of life stood in the midst of Eden (Genesis ii, 9); and the eating of the fruit of that tree was somehow associated with the immortality of Adam's animated body. Jahweh intended to perpetuate this preternatural and deathless union of man's soul with his body, had Adam not sinned. But Adam sinned. He and the human race lost the preternatural gift of immortality. God had threatened: «Dying thou shalt die,» if thou disobey (Genesis ii, 17 and iii, 3). After the disobedience, that threat was fulfilled: «Dust thou art, and unto dust shalt thou return» (Genesis iii, 19). «By one man *the* sin entered into the world; and by *the* sin entered death. And in this wise death passed unto all men, for as much as all sinned» (Romans v, 12). However, the final triumph over death is implied in the promised victory of the seed of the woman over the seed of the serpent (Genesis iii, 15).

**2. Job.**— It is not certain how this revelation of the triumph over death was evolved into a clear belief in the resurrection of the body. All at once we come upon that belief in its full evolution about the 10th century B.C. Our witness is the dramatic epic called the Book of Job. Without any prospect of human comfort, the patient sufferer looks forward to the unending joy of an eternal reunion of his soul and body. The Masoretic, Septuagint and Vulgate traditions of the text are slightly variant, though substantially the same. To the scepticism of Bildad and the Shuhite, Job makes reply:

I know that my Redeemer liveth:
And on the Last Day from the dust shall I rise.
Yea, again shall I be clothed with my skin;
And in my flesh shall I see God.
Him I shall see for myself,
Yea, mine eyes shall look on, not another's.
Full fraught is this hope in my bosom.
(Job xix: 25–27)

**3. Hosea.**— During the dreadful times that preceded the Assyrian exile, Hosea, a prophet of the northern kingdom of Israel, about B.C 750, foretold the triumph of the chosen people in terms that clearly refer to the resurrection, especially to that of the Messias:

Come, let us go back to Jahweh.
For He hath bruised, that He may heal us;
He hath smitten, that He may cure us.
After two days He will quicken us;
On the third day He will raise us up,
That we may live before His face. (Hosea vi, 1–2)

The triumph of Israel over death is a resurrection hope, bound up in the promise of national redemption that Jahweh makes through His prophet:

From the power of She'ol shall I free them;
From death shall I redeem them.
Where is thy sting, O death?
Where is thy doom, O She'ol? (Hosea xiii, 14)

This prophecy, Saint Paul tells the Corinthians (1, Cor. xv, 54–55), is to be fulfilled at the resurrection of the flesh.

**4. Isaiah.**— Shortly before the fall of Samaria B.C. 722, Isaiah, a prophet of the southern kingdom of Judah, intermingled thoughts of the resurrection with his Messianic prophecies. By means of the Messianic triumph Jahweh of hosts «shall cast death down headlong for ever» (xxv, 8). In that day of complete redemption,

Thy dead shall come to life again;
My slain shall rise up again.
Awake and shout for joy,
Ye that dwell in the dust.
For thy dew is a dew of light;
Yea, the earth shall bring forth her dead.
The earth shall unveil her blood;
She shall cover her slain no more. (Is. xxvi, 19–21)

In the prophets of both the Assyrian and the Babylonian period the redemption of Israel from thraldom in Assyria, and of Judah from Babylonian bondage, is a type of the resurrection of the world from slavery to sin. The sacred manumission of the slave to sin, by means of the mediatorship of the Messias, is completed in the glorious resurrection of the body. That is why Isaiah now and then is inspired to shift his thought from the salvation of Israel or of Judah to that of the soul of man by reunion with its body in glory.

**5. Ezechiel.**— Coming to the Babylonian period of prophecy, we find Ezechiel (B.C. 592–586) foretelling the salvation of Judah in terms that vividly picture the resurrection. The prophet in vision stood in the midst of a vast plain «full of bones . . . and, lo, they were very dry.» Then Jahweh prophesied to the bones:

Lo, within you I shall put spirit,
And ye shall live.
I shall grant you sinews,
I shall raise up for you flesh,
I shall set over you skin,
Within you I shall put spirit,
And ye shall live.
(Ezech. xxxvii, 5, 6)

Straightway «there was a noise . . . and a rattling; and the bones moved nigh, each bone to its own bone.» Lastly «came into them the spirit; and they lived, and they stood upon their feet. They were an army exceeding great» (xxxvii, 10). The belief in the resurrection must have been real and universal in Judah; else Ezechiel would not have received and set forth, in terms of that figure, the revelation of the ultimate triumph of his people.

**6. Daniel.**— Throughout the Babylonian Exile (B.C. 586–536) and thereafter, the prophet Daniel is a clear witness to that part of Jewish eschatology, which has to do with the fact of a future resurrection of the body. «At that time Michael, the great leader, who stands for the sons of thy folk, will rise up; and there will be a time of anguish, such as never has been since nation was even until then. At that time shall thy folk be saved,— all that are found to be written in the book. And the multitude of those that sleep in the dust of the ground shall awake,— some unto life eternal, others unto reproach and unto shame eternal. Yea, they that teach wisdom shall shine like the refulgence of the firmament; they that bring many to justice shall be like stars forever and beyond» (xii, 1–3).

**7. The Psalms.**— The Book of Psalms, in its present state, is likely the result of a series of inspired redactions, dating from the time of David (B.C. 1017–977) up to the time of the close of the canon of Esdras (B.C. 444). The soul's longing for immortality is clear, and the resurrection-hope at least faintly glimmers throughout this long period of liturgical evolution of Israelitic hymnody. The Davidic Psalm 16 (15):9, 10 proclaims the immortality of the pious:

> Therefore my heart is glad, and my tongue exults;
> Surely my flesh now abides in hope.
> For thou wilt not give over my soul to She'ol;
> Nor suffer thy pious one to see corruption.

A later Psalm 49 (48):14–15, of the Psalter of the Sons of Korah, consigns the wicked to She'ol and redeems the just:

> Like sheep to She'ol they are driven;
> Death shepherds them;
> The just shall rule over them in the morning;
> Their beauty is for She'ol to waste out of its dwelling.
> Surely God will save my soul from the power of She'ol;
> For He will take me.

Asaph's Psalm 73(72): 24, 25, yearns for immortality. David sings that his joy will be complete in the beatific vision of God, after his awaking from the sleep of death (Psalm 17: 15).

**8. Maccabees.**— During the tortures they underwent, at command of Antiochus IV (B.C. 175–164), the Maccabees appealed to the hope of resurrection as their stay (2 Macc. vii, 9). The third of the seven sons put forth his tongue to be torn out, and hands to be lopped off; and said: «These I despise, for I hope to receive them back again from Him» (2 Macc. vii, 11). The fourth son taunted the king: «It is better to be put to death by men . . . so as to be raised up by God. To thee resurrection will not be unto life» (2 Macc. vii, 14). The author of 2 Maccabees narrates that Judas sent a large offering to Jerusalem, so as to have sacrifices offered in expiation for the sins of the slain; and adds: «In this he acted quite rightly and religiously, having in mind the resurrection. For had he not deemed that they, who had fallen, would rise again, it would have been useless and silly to pray for the dead» (2 Macc. xii, 43, 44).

**9. Apocrypha.**— Though not among the inspired and canonical books of the Bible, the apocrypha bear historical witness to the faith of the period that immediately preceded the foundation of Christianity. In 1 Enoch, Section II, *The Parables*, cc. 37–71, written B.C. 94–79, many details of the resurrection are enumerated. «The earth shall give back that which has been laid away in it; She'ol shall give back that which it has received» (li. 1). All mankind shall rise. The angels shall measure the secrets of all. Not one shall escape. «On the day of the Elect One, not one shall be destroyed before the Lord of Spirits, not one can be destroyed» (lxi, 5). 4 Ezra, 31–44, supposed to have been drawn from an *Ezra Apocalypse* written about B.C 30, is ample and detailed in regard to the universal resurrection and last judgment. «The earth shall restore those that sleep in her; and the dust, those that rest therein.» The Testaments of the Twelve Patriarchs, *Benjamin*, x, 7–10, written B.C. 137–107, teaches that all will rise, «some unto glory and some unto shame»; God will «convict Israel through the chosen ones of the Gentiles.»

**III. New Testament Teaching.**— The time and details of the Parousia are treated elsewhere. (See ESCHATOLOGY). This article is limited to the fact and manner of the resurrection. The current Jewish eschatological belief, at the beginning of the Christian era, is manifested by Martha in regard to her brother Lazarus: «I know that he will rise again at the resurrection on the last day» (John xi, 24).

**1. Doctrine of Jesus.**— Our Lord repeated the Old Testament teaching in this matter. The Sadducees «said there was no resurrection,» and denied even the immortality of the soul (Josephus, ‹Antiquitates Judaicæ› XVIII, i, 4). They proposed to Jesus the case of a woman, who by the Mosaic law of *go'el* had married seven brothers, one after the other. «At the resurrection, to whom of the seven will she be wife?» In reply, our Saviour blamed them because of ignorance of Scripture. «For at the resurrection there will be no marrying nor being married; but they will be as angels in heaven.» The glorified body will not be subject to the appetites of the flesh. The Sadducees grossly caricature the glory of the resurrected body. Its joy is of God. «He is not a God of the dead, but of the living» (Matt. xxii, 23–32; Luke xx, 28–38). Besides, Jesus claimed that, as Son of Man, He would be the Judge of men (John v, 23–27). He added: «A time is coming and now is, when the dead shall hear the voice of the Son of God; and they that hear shall live. . . . A time is coming when all who are in their graves shall hear His voice. And they shall come forth — they that have done good, unto a resurrection of life; they that have done evil, unto a resurrection of condemnation» (John v, 28, 29). This resurrection unto life, Jesus promises, He Himself will accomplish in the case of those that believe in Him (John vi, 39, 40); follow the impulses of God's grace (John vi, 44); eat the flesh and drink the blood of the Son of Man (John vi, 45). He said to Martha «I am the resurrection and the life. He that believes in me shall live, though he die; yea, he shall never die, who lives and believes in me» (John xi, 25, 26). The charitable shall receive their «reward at the resurrection of the good» (Luke xiv, 14). The unjust also will rise from the dead to be punished for their sins (Matt. v, 29, 30; Mark, ix, 43–49); they will go soul and body to hell (Matt. x, 28). At the Parousia, the risen just will stand at the right, and the risen unjust at the left of the Judge. He will pronounce sentence of damnation of the latter to eternal fire, and of welcome of the former to everlasting bliss (Matt. xxv, 31–46).

**2. Doctrine of Saint Paul.**— In keeping with his teaching that the Church is the mystic Christ, whereof Jesus is the mystic Head and we are the members, Saint Paul links together two correlative doctrines. The first is that of the mystic resurrection of both Head and members, by the rising of the soul above things of sin. The second is the teaching that the physical resurrection of the Head postulates the rising of the members: «Now if it be preached that Christ rose from the dead, how is it some among you say there is no resurrection of the dead? Why, if there be no resurrection of the dead, not even Christ is risen. And if Christ is not risen, then vain is our preaching — yea, vain is your faith; and we are proven to have been false witnesses of God; forasmuch as we have testified of God that He raised the Christ, whom He did not raise — if, forsooth, the dead do not rise» (1 Cor. xv, 12, 15). This denial of the resurrection is due to an infiltration into the Corinthian Church either of Sadducean ideas or of the Hellenism that scouted the doctrine upon the Hill of Ares in Athens (Acts xvii, 32). To show how fundamental is belief in the resurrection, Saint Paul urges the doctrine at Athens (Acts xvii, 18), at Jerusalem (Acts xxiii, 6), before Felix (Acts xxiv, 15), and Agrippa (Acts xxvi, 8). The Pauline letters again and again present the argument: Jesus, the Head of the mystic Christ is risen; therefore, we, the members of that mystic Christ, the Church, shall also rise from the dead (Romans viii, 11; 1 Cor. vi, 14; 2 Cor. iv, 14; 1 Thess. iv, 14; 2 Tim. ii, 11). Christ, «the first of those that sleep» the sleep of death, is the second Adam. As body and soul are separated in death because of the sin of the first Adam; so body and soul come together after death because of the merit of the second Adam (1 Cor. xv, 20–23). «He will transform the body of our lowliness, that it may be conformed with His Body of glory, by the same power that enabled Him to subject all things to himself» (Phil. iii, 21). If this be not true, then one may as well follow one's lower appetites, and act according to an Epicurean fundamental principle of life: «Let us eat and drink; for to-morrow we die» (1 Cor. xv, 32, citing Isaias, xxii, 13).

**3. Manner of the Resurrection.**— Saint Paul preached «a resurrection of the just and the unjust alike» (Acts xxiv, 15). True, his letters generally have to do with the rising only of the just, who have died in the mystic union with Christ by grace. Yet He clearly means that both the just and the unjust will rise unto immortality in the same bodies as were animated by the soul before death. It would not be resurrection, were the dead to rise in bodies not their own. These identical bodies, in all their entirety, will be so transformed at the resurrection as to be immortal. The transformation of the living, at the Last Day, will be consequent upon the equivalent of death, a summary death that will be immediately followed by resurrection. The living will not then die the lasting death, which the Apostle calls sleep. «We shall not all sleep; but we shall all be transformed in a moment, in the twinkling of an eye, at the last trumpet-call. For the trumpet will sound, and the dead will rise immortal, and we also shall be transformed» (1 Cor. xv, 51, 52). As the grain of wheat differs from the blade that shoots up therefrom, so the earthly body differs from the transformed (1 Cor. 36, 37). To the just, this immortality of the transformed body will be an everlasting joy; to the unjust, a never ending torture. This torture is vividly described in Matt. v, 29, 30; xxv, 41–46; Mark, ix, 43–49; and Apoc. ix. In the last pericope, it is expressly stated that the tortures of the wicked are «not allowed to kill them.» The tortured «will seek death, and will not find it; they will long to die, but death will flee from them» (Apoc. ix, 5, 6).

In what will the transformation of the bodies of the just consist? Saint Paul tells us, after putting himself the questions: «How shall the dead rise? With what sort of body shall they come forth?» (1 Cor. xv, 35–57). Four qualities of spirit will transform the risen bodies of the just. The first of these qualities is *impassibility,* by which the glorified body is not subject to pain and is forever freed from those organic changes that end in death. «For this perishable body must put on an imperishable form: and this dying body must put on a deathless form» (verse 53). The second quality of the glorious risen body is *glory,* or brightness, by which the bodies of the saints are refulgent and dazzling in beauty, and «shine like the sun» (Matt. xiii, 43). «There are heavenly bodies and earthly bodies: but the glory of the heavenly bodies is not the glory of the earthly. The glory of the sun is not the glory of the moon, nor the glory of the stars: for star differs from star in glory. Even in such wise is the resurrection of the dead» (1 Cor. xv, 40, 41). The third quality of the bodies of the risen just is *agility,* by which the risen body is freed from the hindrance of gravity and speedily moves through space like as does a spirit. Saint Paul has this agility in mind, when he writes: «With a summons, with a voice of an archangel, with a trumpet-blast of God, the Lord Himself will come down from heaven. Then the dead in Christ shall rise first; and afterward we, if we be alive, if we be left over, shall with them be caught up into the clouds to meet the Lord in the air. And so we shall ever be with the Lord» (1 Thess. iv, 16–18). The fourth quality of the glorified body is *subtility,* by which it becomes spiritualized or like to a spirit, passes through material objects as did the glorified body of Christ and is under the absolute control of the soul. «Sown mortal, it rises immortal; sown tainted, it rises glorious; sown weak, it rises mighty; sown an animated body, it rises a spiritualized body. As surely as there is an animated body, so is there a spiritualized» (I Cor. xv, 42–44).

**IV. Ecclesiastical and Patristic Evidence.** — The creeds of the Church, from the beginnings of Christianity, have contained the belief in the resurrection of the dead. Such are the Apostles' Creed, as witnessed to by Justin (A.D. 138–165), Tertullian (194–221), Phœbadius (d. c. 392), Rufinus (d. 410) and Epiphanius (d. 374); the *Fides Damasi* (c. 380), the Nicene-Constantinopolitan Creed (381), *Libellus in modum Symboli* (referred to by Gennadius c. 490), the *Quicunque* (fifth cent.) and later creeds. So, too, the Fathers bear overwhelming witness to the doctrine of the resurrection. We cite only the earliest: Clement of Rome, (1 Cor. 25); Justin, 'Contra Tryphonem,' 80; Athenagoras, 'De resurrectione carnis,' 3; Tatian, 'Adversus Græcos,' 6; Tertullian, 'Marcion,' v, 9, and 'De resurrectione carnis,' 1; Irenæus, 'Contra Hæreses,' i, 10; Minucius Felix, 'Octavius,' 34; Origen, in Matt. xxix; Hippolytus, 'Adversus Græcos' (in Migne, 'Patrologia Græca,' x, 799); Cyril of Jerusalem, Ephraim, Epiphanius, Basil and a vast list of later Fathers.

**V. Resurrection of Christ.**— One of the fundamental facts of Christianity is the resurrection of Christ; without this fact, the whole fabric of our apologetic falls to the ground and there is no hope of any life after death. «If Christ is not risen, vain is your faith, ye are still in your sins; yea, and they, that have passed to their rest in union with Christ, are lost. Why, if we have hoped in the mystic union with Christ for this life alone, then are we the most to be pitied of all mankind» (1 Cor. xv, 16–19). Hence it is of prime importance to establish the resurrection of Christ as an historical fact. We do so from the four Gospels and the letters of Saint Paul, taken as historical documents, the substantial historicity of which no prudent man has any right to deny.

*First,* Jesus appealed to His future resurrection in proof of the truth of His claim that He was the Ambassador of God the Father and that he had from God the Father a message for the world. This fact is clear to any reader of the historical documents called Matthew, Mark, Luke and John. Witness the sign of Jonas: «Just as Jonas was in the belly of the sea-monster three days and three nights, so shall the Son of Man be in the earth three days and three nights» (Matt. xii, 39–41). Witness the sign of the Temple: «'Destroy this temple, and in three days I will raise it up' . . . He was speaking of the temple of His body» (John ii, 18–22). Witness, finally, the repeated and detailed prophecy of the oncoming death and resurrection of Jesus: «He shall be delivered to the Gentiles; and shall be mocked, and scourged, and spat upon. And after they shall have scourged Him, they shall kill Him. And the third day He shall rise again.» This prophecy is given, in substantially the same form, three times by Matthew (xvi, 21; xvii, 12 and 22, 23; xx, 18, 19); three times by Mark (viii, 31; ix, 11–13 and 30; x, 33, 34), and twice by Luke (ix, 22; xviii, 31–34). There can be absolutely no doubt about this fact. Jesus clearly appealed to His future resurrection in proof of the truth of His claim that He had from the Father a message for the world.

*Secondly,* Jesus arose from the dead to fulfill His prophecy in proof of the truth of His claim to divine ambassadorship, to the message from the Father and to the right to give that message to the world. This fact is denied only by those who start by throwing out of court miracles, prophecies and all supernatural elements of religion. Their theories are summed up under Christology (q.v.). Against these theories are the subjoined, clear facts of our documents. The chronological order of these facts is matter of dispute; of the facts themselves there is no doubt. They bear conclusive witness to the physical resurrection of Jesus. 1. The leaders of the priestly party and the Pharisees called to the attention of Pilate the prophecy of Jesus: «After three days I shall rise again.» They demanded a guard, lest the disciples might steal the body of the dead Teacher and then say: «He is risen from the dead.» The tomb was closed with a rolling stone; the stone was sealed with the official seal; a guard was set to prevent stealth (Matt. xxvii, 62–66). 2. Saturday evening, after sunset, the holy women visited the tomb, returned, bought spices and ointments (Matt. xxviii, 1; Mark xvi, 1; Luke xxiii, 56). 3. Christ arose early Sunday, the earth quaked, the angel rolled back the stone from the entrance to the tomb, the guards were terror stricken and lost consciousness (Matt, xxviii, 2–4). 4. While it was yet dark, Sunday morning (John xx, 1), the women started for the tomb; they arrived at daybreak (Mark xvi, 2) and found the stone rolled back (Mark xvi, 3, 4; Luke xxiv, 1, 2); straightway Mary Magdalen returned to tell the apostles (John xx, 2). 5. The rest of the holy women entered the tomb and saw two angels standing (Luke xxiv, 3, 4) and one sitting (Mark xvi, 5); they were told that Jesus had risen, and were sent back to inform the apostles (Matt. xxviii, 5–8; Mark xvi, 6, 7; Luke xxiv, 5–11); but were so frightened as to say nothing (Mark xvi, 8). 6. After hearing the story of Mary, Peter and John ran to the tomb and found it empty (Luke xxiv, 12; John xx, 3–10). 7. Mary Magdalen returned to the tomb; Jesus appeared to her (Mark xvi, 9–11; John xx, 11–18). 8. Jesus appeared to the holy women, who had been affrighted by the vision of angels (Matt. xxviii, 9, 10); meantime the guards were bribed to say that the body of Jesus had been stolen by the disciples, while the soldiers were asleep (Matt. xxviii, 11–15). 9. Jesus appeared to the two disciples going to Emmaus (Mark xvi, 12, 13; Luke xxiv, 13–33). 10. The fourth appartion of Christ was to Peter (Luke xxiv, 34, 35). 11. Jesus appeared to 10 apostles at Jerusalem, in the absence of Thomas (Mark xvi, 14; Luke xxiv, 36–49; John xx, 19–25). 12. Eight days after these five apparitions of the first Easter Sunday, Jesus again appeared to the apostles, and this time Thomas was present (John xx, 26–31). 13. The seventh apparition was by the Sea of Galilee, to seven apostles; the Saviour then entrusted Peter with the primacy in shepherding His flock (John xxi). 14. On a mountain in Galilee, at the eighth apparition of the risen Saviour, He gave His Own world-mission to the apostles (Matt. xxviii, 16–20). 15. On Mount Olivet, Jesus repeated to His apostles the command to preach the Father's message to the world, and He then ascended into heaven (Mark xvi, 15–19; Luke xxiv, 50, 51).

Briefly, then, in nine apparitions recorded by the evangelists; and in three apparitions handed down by Paul alone — to James, to Paul, and «to more than 500 of the brethren at one time» (1 Corinthians xv, 3–8) — Jesus spoke, ate, walked and acted otherwise as He had acted before death. He proved to His followers that He was risen from the dead. In the court of historical evidence, there can be no prudent doubt of the validity of the testimony that we have summed up. Matthew, John and Paul were eye-witnesses of what they narrate. Mark and Luke had personal intercourse with the eye-witnesses of the risen Christ. Hence, first, our witnesses could readily have known the facts they handed down to us. Secondly, there is no reason to suppose that they falsified the facts they state. They intended to tell the truth in regard to the risen Jesus. They told the truth, as they deemed it to be truth. They had absolutely nothing to gain by telling the truth — nothing that the world deems worth the while. They had all to lose by telling the truth — all that the world rates high. To gain, they had poverty, contumely, failure in name and fame, by the propaganda of the worship of a crucified Man-God; by the spread of His otherworldliness — love of enemies, forgiveness of injuries, renunciation of wealth and power; and by death itself. Matthew and Paul were actually put to death for their pains in telling the truth about

Jesus; John endured tortures that naturally should have caused his death; Mark, also, was martyred for his witness to the truth that he wrote.

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**RESURRECTION,** a novel by Leon Tolstoy, published in 1900. It presents in the author's strongest manner the theme of the development of a great character, besides offering a picture of Russian society, from the wealthy office-holding circle, to the peasants and common soldiers, jailers and criminal classes. Nekhludoff, a noble, in the effort to right the wrong he has done to another, unconsciously rights the wrong done in himself by the false social outlook and inadequate education which had made him what he was and constructs for himself a new and broadly human creed of living.

**RESURRECTION FERN.** See FERNS AND FERN-ALLIES.

**RESURRECTION PLANT.** See ROSE OF JERICHO.

**RESURRECTION SISTERS.** See ORDERS, RELIGIOUS.

**RESURRECTIONISTS, or BODY-SNATCHERS,** a class of miscreants who, in Britain previous to the passing of the Anatomy Act of 1832, made a livelihood by rifling graves, taking out the corpses and selling them to schools of medicine and surgery as «subjects» for dissection or demonstration. So long as in Britain the supply of «subjects» from the gallows sufficed for the needs of the schools, there was no call for a resort to illegal means. But when, in the progressive reform of criminal law, capital punishment was less frequently inflicted, while medical and surgical schools were greatly multiplied, the necessity for «subjects» overrode the laws, and the trade of the resurrectionist flourished. As the schools were mostly in London the graveyards in the vicinity of the metropolis were the main resource of the body-snatchers, with whom the grave-diggers and the caretakers were usually in league. As the business was naturally risky and precarious the price of «subjects» was, for each, $40 to $50. To protect the bodies of the newly interred their graves would be protected with strong gratings or spring-guns would be set at night, or the friends of the deceased would keep watch, armed, over the graves for several nights till the bodies had become unfit for use in the schools. These precautions made the business of the body-snatchers even more risky, and «subjects» would be sought in various localities throughout the kingdom. As the price paid by the doctors rose and the risk grew greater, it occurred to one Burke at Edinburgh to provide subjects for the dissecting table by killing people instead of violating graves. He was hanged at Edinburgh 28 Jan. 1829, convicted of having dispatched 15 victims and sold their bodies to the doctors. The first Anatomy Act of the British Parliament (1832) provides that schools of anatomy and teachers and demonstrators of anatomy shall be licensed; such schools and such teachers are empowered to receive as subjects for dissection the cadavers of persons dying friendless, in poorhouses, hospitals and elsewhere; and the trade of the resurrectionist was practically done away in Britain by the passage of the act. In the United States there are not in any of the individual States any statutes regulating the practice of anatomical dissection: the plundering of graves for subjects of dissection is a misdemeanor for which the offender may be indicted at common law. Instances are not very rare of the bodies of persons, not friendless, who die in public or quasi-public hospitals, being, without legal warrant, sold to the schools by subordinate employees of such hospitals. Body-snatching, or rifling of graves for the purpose of exacting a ransom from the families of the dead is not infrequent: a notable instance was that of the stealing of the body of A. T. Stewart, well-known New York merchant, in 1878, from the cathedral at Garden City, Long Island. The body-snatchers in this case demanded a ransom of $200,000, which afterward they reduced to half that sum: finally, they received $20,000 with the assurance that they should not be prosecuted. Since that time extraordinary precautions are taken against body-snatching from the graves, especially of very rich persons. Consult Bailey, J. B., ed. 'The Diary of a Resurrectionist' (London 1896).

**RESZKE,** rĕsh'kĕ, **Edouard de,** Polish opera singer: b. Warsaw, 23 Dec. 1856; d. 30 May 1917. He studied at the Collège de l'Agriculture of Proskao, and then turned attention to the cultivation of his remarkable bass voice. He appeared in Paris in 1876 at the Théâtre Italien, and afterward in the large cities of Europe and America. He created the role of the King in Catalini's 'Edda' and Carlo V, in

Marchetti's 'Don Giovanni d'Austria' at Turin. He was especially identified with Mephistopheles in 'Faust'; Frère Laurent in 'Romeo et Juliette,' and the Wagnerian roles of Hans Sachs, Wotan and King Mark.

**RESZKE, Jean de,** Polish opera singer: brother of Edouard de Reszke (q.v.): b. Warsaw, 14 Jan. 1853. He completed the law course at the Warsaw University; but having been surrounded by a musical atmosphere in his home, and having sung as a boy in the cathedral, he decided upon singing as a career. He studied with Ciaffei and Cologni in Italy and made his début in Venice in 1874 as Alfonso in 'La Favorita.' In the two following years he appeared in London and Paris. Hitherto he had sung baritone roles, but in 1876 he retired to cultivate his natural voice whose register was that of a tenor. In 1880 he reappeared, singing at Madrid in 'Robert le Diable.' Following this he created the part of Jean in Massenet's 'Herodiade' in Paris and was engaged at the Opera where he sang from 1885 to 1890, appearing in 'Le Prophète,' 'L'Africaine,' 'Aïda,' 'Faust,' 'Romeo et Juliette,' 'Don Juan,' and 'Le Cid' which Massenet composed for him. From 1893–99 he appeared continuously at the Metropolitan Opera House, New York, where he added to the foregoing roles several Wagnerian parts, particularly 'Siegfred.' In later years he was associated artistically with his brother Edouard. He retired from the stage in 1902 and subseqently devoted himself to vocal teaching in Paris.

**RETAINING WALL,** a wall usually of masonry, erected for the purpose of confining a body of water in a reservoir, or for resisting the thrust of the ground behind it. Without such a wall the earth would slide, or lie at a considerable angle off the perpendicular. A bank of rock may hold itself, but gravel, sand or loose earth will slide and wash away and requires a retaining wall to confine it. The amount of resistance or strength in the wall depends partly on the material held back and partly on the angle of repose, that is the angle beyond which the sand, gravel, etc., will slide. The pressure against the wall is produced by the material filling the space between the angle of repose and the face of the wall. As a general rule the thickness of retaining walls is made one-third the height of the bank which they are intended to support. In estimating the requisite thickness of the wall, account must be taken of the different ways in which it may be displaced, as by overturning, slipping along its entire base, or the giving way of the upper parts while the base remains. In reservoir walls of masonry, the thickness should be made practically double that of ordinary earth retaining walls. In the case of loose soil, readily rendered fluid by rains, as at Panama, the greatest engineering difficulties have been encountered. (See PANAMA CANAL). The great irrigation projects of the West and the Ashokan reservoir in New York presented vast problems in building retaining walls. Consult Cain, 'Practical Designing of Retaining Walls' (1914); Baker, 'Treatise in Masonry Construction' (1900); Merriman, 'Masonry' (1915). See DAMS; IRRIGATION; MASONRY AND BUILDING; RESERVOIR.

**RETARDATION OF PUPILS.** This term is popularly used by educators to mean that a pupil is old in years for his grade, on the basis of being in the first grade of the elementary school course at the age of six or seven years. According to this general plan. all pupils who were eight years old or more, and were found in the first grade at any time during the school year would be considered as retarded. In the same manner all second grade pupils nine years old and over are retarded. This general standpoint of a leeway of two years in the standard age with its possible application at any time during the school year when the data may be collected from pupils and teachers is, however, far too loose in its application to serve as a very definite measure. The proper standard of age is that a pupil should begin the elementary school course at the first opportunity presented after he has passed his sixth birthday. In most cities this opportunity comes within six months, and the custom of midyear promotions is quite universal. In order to provide for those cities which promote only once a year, the standard should be made six years but less than seven years for *beginning* the first grade; seven years but less than eight years for *beginning* the second grade. This scale of pupils' ages is not based upon the mere fact that a pupil is *in a certain grade* at some time during the school year, but upon the pupil's commencement of the work of a certain grade involving the actual completion of previous grades. This definite standard has been adopted by the superintendents of New York State. Age is figured as of the nearest birthday. The exact definition of retardation is, however, not covered even by this well-defined plan of figuring age for beginning or completing a particular grade, because many children do not start school at the age of six years, but wait until they are seven or eight years old, and once entering their progress is in many cases entirely regular. The correct conception of a retarded pupil is one who has spent *a longer time in school* than the usual period required to finish a given grade or place him at the beginning of the next advanced grade. In other words, the normally progressing pupil completes one grade in one school year, and a retarded second grade pupil would be one who began that grade with more than one year of previous schooling; a retarded third grade pupil would be one beginning that grade with more than two years of previous schooling, etc.

The age basis alone is inaccurate for all pupils who do not happen to enter school between their sixth and seventh birthdays. On the basis of time-in-school, however, no pupil is charged with retardation unless he has actually spent more than the allotted time to achieve a given point in his school progress. Owing to the absence of complete progress records in schools at the present time, however, the age basis is the only measure on which information is available on a broad scale, and for this reason it is valuable and its compilation is worth while. Modern practice combines the tabulation of both age and progress figures. It is evident that a pupil may get an early start and make normal progress. Another may make a late start and progress normally, and since a given pupil may be young, normal or overage, and may at the same time make rapid, normal or slow progress, we have nine possible categories of pupils with reference to these conditions, as follows:

1 Underage and rapid progress
2 Normal age and rapid progress
3 Overage and rapid progress
4 Underage and normal progress
5 Normal both as to age and progress
6 Overage and normal progress
7 Underage and slow progress
8 Normal age and slow progress
9 Overage and slow progress

These are best shown in the following arrangement of the groups:

| | | |
|---|---|---|
| Underage and rapid progress | Normal age and rapid progress | Overage and rapid progress |
| Underage and normal progress | Normal both as to age and progress | Overage and normal progress |
| Underage and slow progress | Normal age and slow progress | Overage and slow progress |

According to this plan the results of the statistical research in the cities undertaking this work during 1916–17 are given.

An analysis of 46,000 pupils on this plan is given in Table 1, Fig. 1.

TABLE 1.

46,000 PUPILS IN TWENTY-TWO CITIES IN NEW YORK STATE.

| PUPILS | Numbers | | | | Percentages | | | |
|---|---|---|---|---|---|---|---|---|
| | Underage | Normal age | Overage | Total | Underage | Normal age | Overage | Total |
| Rapid progress.. | 1,356 | 1,195 | 820 | 3,371 | 2.9 | 2.6 | 1.8 | 7.3 |
| Normal progress.. | 2,710 | 16,220 | 7,921 | 26,851 | 5.9 | 35.3 | 17.2 | 58.4 |
| Slow progress.. | 315 | 3,148 | 12,338 | 15,801 | 0.7 | 6.8 | 26.8 | 34.3 |
| Total.. | 4,381 | 20,563 | 21,079 | 46,023 | 9.5 | 44.7 | 45.8 | 100 |

Public school pupils commonly move from city to city, and within the same city they frequently transfer back and forth between parochial and public schools as well as from one public school to another. These changes in the location of pupils' schooling affect their progress to a considerable extent as shown in subdivision A, Table 2, and in Fig. 2.

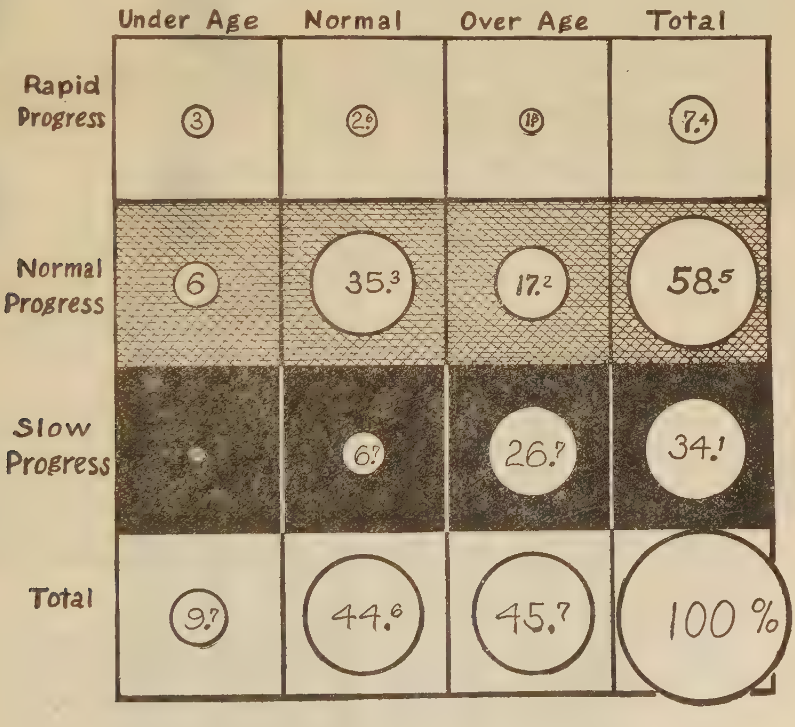

FIG. 1.

Age and progress of elementary pupils.

This age-progress percentage chart represents the nine groups of pupils shown in the text just preceding table 1. The figures show percentages alone and not the actual number of pupils and correspond to table 1 to which additions were made after the figure had been drawn, which slightly changed the decimals in some of the percentage figures. The total of 100 per cent is the sum of the nine groups, not of the 15 other circles in the figure, 6 of which, 3 at the right and 3 at the bottom, are subtotals.

### TABLE 2.

### AGE-PROGRESS ANALYSIS OF 3,665 ELEMENTARY PUPILS BY SCHOOL LOCATION.

*A—All Pupils Enrolled.*

| PUPILS | Numbers | | | | Percentages | | | |
|---|---|---|---|---|---|---|---|---|
| | Underage | Normal age | Overage | Total | Underage | Normal age | Overage | Total |
| Rapid progress.. | 120 | 96 | 101 | 317 | 3.3 | 2.6 | 2.8 | 8.7 |
| Normal progress. | 370 | 641 | 431 | 1,442 | 10.0 | 17.5 | 11.8 | 39.3 |
| Slow progress... | 119 | 353 | 1,434 | 1,906 | 3.3 | 9.6 | 39.1 | 50.0 |
| Total...... | 609 | 1,090 | 1,966 | 3,665 | 16.6 | 29.7 | 53.7 | 100 |

*B—2,289 Pupils Schooled Entirely in Local Public Schools.*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Rapid progress.. | 95 | 59 | 35 | 189 | 4.2 | 2.6 | 1.5 | 8.3 |
| Normal progress. | 323 | 500 | 208 | 1,031 | 14.1 | 21.8 | 9.1 | 45. |
| Slow progress... | 100 | 275 | 694 | 1,069 | 4.4 | 12. | 30.3 | 46.7 |
| Total...... | 518 | 834 | 937 | 2,289 | 22.7 | 36.4 | 40.9 | 100 |

*C—836 Pupils Schooled Entirely in Two or More Local Public Schools.*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Rapid progress.. | 19 | 11 | 8 | 38 | 2.3 | 1.3 | 1.0 | 4.6 |
| Normal progress. | 82 | 148 | 101 | 331 | 9.8 | 17.7 | 12.2 | 39.6 |
| Slow progress... | 60 | 98 | 309 | 467 | 7.2 | 11.7 | 36.9 | 55.8 |
| Total...... | 161 | 257 | 418 | 836 | 19.2 | 30.7 | 50.1 | 100 |

*D—1453 Pupils Schooled Entirely in One School.*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Rapid progress.. | 76 | 48 | 27 | 151 | 5 | 3 | 2 | 10 |
| Normal progress. | 241 | 352 | 107 | 700 | 17 | 24 | 7 | 48 |
| Slow progress... | 40 | 177 | 385 | 602 | 3 | 12 | 27 | 42 |
| Total...... | 357 | 577 | 519 | 1,453 | 25 | 39 | 36 | 100 |

*E—785 Pupils Schooled Partly in Local Non-Public Schools.*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Rapid progress.. | 5 | 14 | 42 | 61 | 0.6 | 1.8 | 5.3 | 7.7 |
| Normal progress. | 24 | 66 | 133 | 223 | 3.1 | 8.4 | 16.9 | 28.4 |
| Slow progress... | 9 | 45 | 447 | 501 | 1.2 | 5.7 | 57. | 63.9 |
| Total...... | 38 | 125 | 622 | 785 | 4.9 | 15.9 | 79.2 | 100 |

*F—458 Pupils Partly Schooled in Other Cities.*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Rapid progress.. | 18 | 21 | 21 | 60 | 3.9 | 4.6 | 4.6 | 13.1 |
| Normal progress. | 20 | 66 | 66 | 152 | 4.4 | 14.4 | 14.4 | 33.2 |
| Slow progress... | 10 | 29 | 207 | 246 | 2.2 | 6.3 | 45.2 | 53.7 |
| Total...... | 48 | 116 | 294 | 458 | 10.5 | 25.3 | 64.2 | 100 |

*G—133 Pupils Partly Schooled in Foreign Countries.*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Rapid progress.. | 2 | 2 | 3 | 7 | 2 | 2 | 2 | 6 |
| Normal progress. | 3 | 9 | 24 | 36 | 2 | 6 | 18 | 26 |
| Slow progress... | 0 | 4 | 86 | 90 | 0 | 3 | 65 | 68 |
| Total...... | 5 | 15 | 113 | 133 | 4 | 11 | 85 | 100 |

This table shows that at the very start there are three types of location factors which have to be analyzed quantitatively before the superintendent can even begin to interpret his own age-progress figures: (1) changes within his system, (2) the combination of public and parochial schooling, and (3) the combination of local and out-of-town schooling. The great difference between the number of pupils who are overage, who are slow and who are both old and slow shows the inadequacy of either age or years-in-school alone as a measure of retardation, and the handicap under which those superintendents are working who have not the aid and support of a complete system of individual permanent record cards, so essential to the demands of modern supervision considered locally and entirely apart from any collective research such as this discussion. Even this sevenfold table does not tell the complete story of local and outside retardation, to determine both of which requires the correlation of each pupil's progress with the proportion of his total schooling received in the local public system and obtained elsewhere, a task which, while somewhat involved, is quickly accomplished by means of the mechanical tabulation of these statistics with electrical machines.

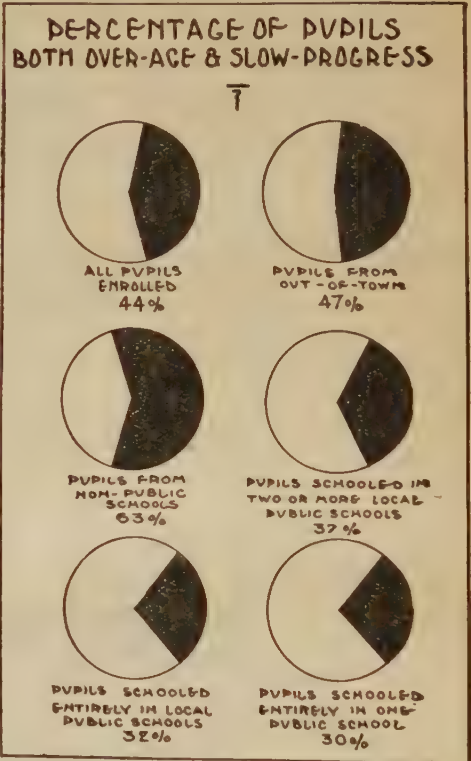

FIG. 2.

This figure should not be misinterpreted as showing the relative number of pupils who have been schooled entirely in the local system or have come into it from the outside. It represents groups of pupils based on the location of their previous schooling, ranging in size from 133 pupils partly schooled in foreign countries to the grand total of 3,665 found in the public schools at the time of the survey. Each circle represents 100 per cent of its own group and the black sector shows the percentage of these that are retarded.

**Analysis by Grades.**— Tables 1 and 2 present figures for all pupils in a city system belonging to the several groups. In order to gain an adequate notion of the retardation in a school system it is essential to have a separate analysis of each of the eight regular grades of the elementary course. The extent to which slow progress varies in the different grades is shown in Table 3, Fig. 3.

TABLE 3.

PROGRESS PERCENTAGES OF 286,207 PUPILS IN 41 CITIES, 29 VILLAGES AND 493 UNION FREE SCHOOL DISTRICTS.

| GRADE | Rapid | Normal | 1 year slow | 2 years slow | 3 years slow | 4 years slow | 5 years slow | 6 years slow | Total slow | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ........ | 38,112 | 7,501 | 841 | 154 | 19 | 10 | 6 | 8,531 | 46,643 |
| 2 | 2,225 | 28,026 | 8,900 | 2,108 | 357 | 83 | 24 | 8 | 11,479 | 41,730 |
| 3 | 2,917 | 24,796 | 8,120 | 2,325 | 631 | 180 | 41 | 10 | 11,309 | 39,018 |
| 4 | 3,773 | 21,599 | 9,247 | 2,964 | 923 | 296 | 84 | 19 | 13,533 | 38,905 |
| 5 | 4,152 | 18,815 | 8,990 | 3,109 | 1,053 | 306 | 58 | 14 | 13,222 | 36,497 |
| 6 | 4,568 | 16,402 | 7,963 | 2,684 | 801 | 217 | 28 | 12 | 11,609 | 32,579 |
| 7 | 4,854 | 13,875 | 6,126 | 1,693 | 416 | 67 | 11 | 1 | 8,314 | 27,043 |
| 8 | 4,639 | 12,798 | 4,709 | 1,298 | 274 | 72 | 2 | ........ | 6,355 | 23,792 |
| Total | 27,128 | 174,419 | 61,556 | 16,925 | 4,608 | 1,240 | 259 | 70 | 84,660 | 286,207 |

*Percentages*

| GRADE | Rapid | Normal | 1 year slow | 2 years slow | 3 years slow | 4 years slow | 5 years slow | 6 years slow | Total slow | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ........ | 81.69 | 16.07 | 1.80 | .330 | .047 | .027 | .012 | 18.3 | 100 |
| 2 | 5.33 | 67.16 | 21.31 | 5.05 | .852 | .198 | .057 | .019 | 27.51 | 100 |
| 3 | 7.47 | 63.54 | 20.81 | 5.95 | 1.617 | .461 | .105 | .025 | 28.98 | 100 |
| 4 | 9.67 | 55.51 | 26.09 | 7.62 | 2.372 | .760 | .215 | .049 | 34.78 | 100 |
| 5 | 11.37 | 51.55 | 24.63 | 8.52 | 2.885 | .838 | .158 | .038 | 37.07 | 100 |
| 6 | 14.02 | 50.34 | 24.44 | 7.94 | 2.458 | .666 | .088 | .036 | 35.63 | 100 |
| 7 | 17.94 | 51.31 | 22.65 | 6.26 | 1.530 | .247 | .040 | .004 | 30.74 | 100 |
| 8 | 19.49 | 53.77 | 19.79 | 5.46 | 1.150 | .300 | .08 | ........ | 26.71 | 100 |
| Total | 9.48 | 60.94 | 21.51 | 5.91 | 1.608 | .433 | .091 | .025 | 29.58 | 100 |

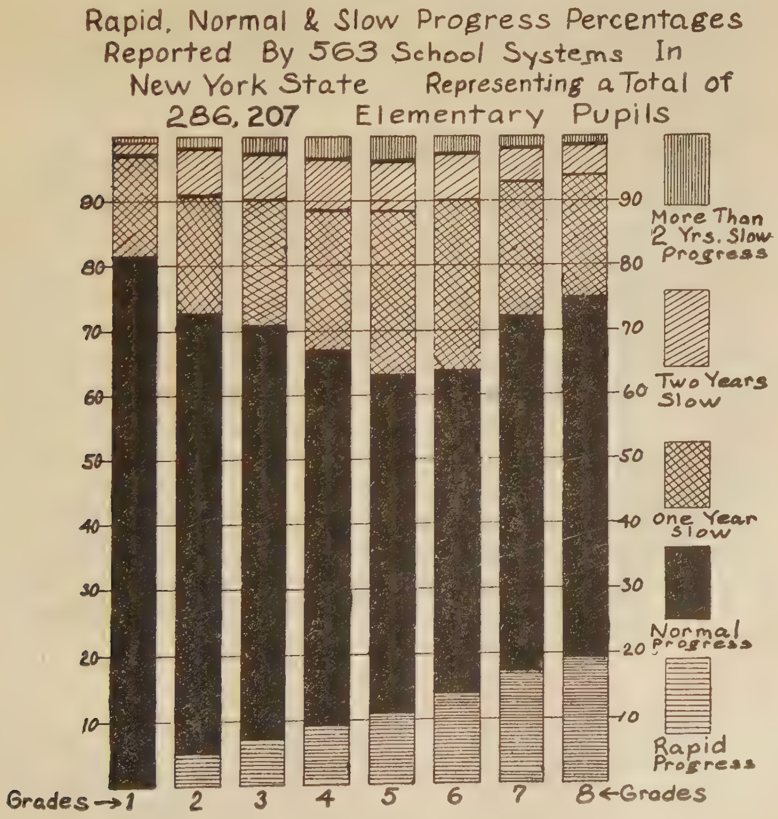

FIG. 3.

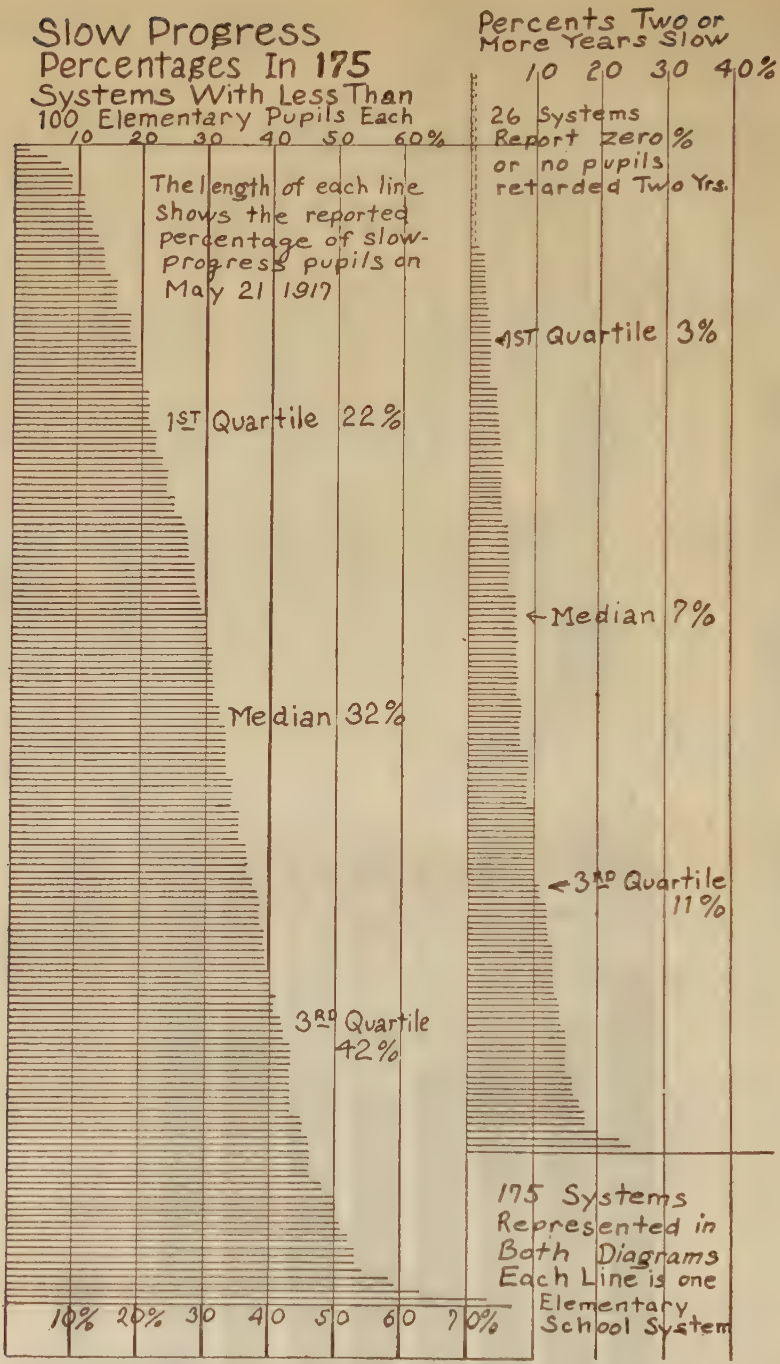

FIG. 4.

**School Systems of Different Sizes.**— In addition to the analysis by school locations and by grades, it is very essential not to limit the study of retardation to one school system, but to gather similar data from a number of school systems of comparable size. When this has been done the figures should be tabulated in the order of the slow progress percentage of each contributing place. Such an arrangement is graphically represented in Fig. 4 above, and shown in Table 4 on the following page.

TABLE 4.

SLOW-PROGRESS PERCENTAGES REPORTED BY 175 UNION FREE SCHOOL DISTRICTS WITH AN ELEMENTARY ENROLMENT BELOW 100.

| SLOW-PROGRESS PERCENTAGES REPORTED | Number reporting | Per cent two or more years retarded | Number reporting |
|---|---|---|---|
| 2 | 1 | 0 | 23 |
| 5 | 1 | 1 | 1 |
| 7 | 1 | 2 | 12 |
| 8 | 1 | 3-$Q^1$ | 11 |
| 9 | 3 | 4 | 11 |
| 11 | 3 | 5 | 12 |
| 12 | 3 | 6 | 11 |
| 13 | 2 | 7-Md | 17 |
| 14 | 4 | 8 | 9 |
| 15 | 1 | 9 | 10 |
| 16 | 5 | 10 | 14 |
| 18 | 5 | 11-$Q^3$ | 3 |
| 19 | 4 | 12 | 7 |
| 20 | 3 | 13 | 9 |
| 21 | 6 | 14 | 5 |
| 22-$Q^1$ | 4 | 15 | 7 |
| 23 | 2 | 16 | 4 |
| 24 | 4 | 17 | 2 |
| 25 | 3 | 18 | 3 |
| 26 | 2 | 20 | 1 |
| 27 | 5 | 23 | 1 |
| 28 | 5 | 25 | 1 |
| 29 | 3 | 46 | 1 |
| 30 | 5 | | |
| 31 | 9 | | |
| 32-Md | 3 | | |
| 33 | 8 | | |
| 34 | 5 | | |
| 35 | 5 | | |
| 36 | 5 | | |
| 37 | 2 | | |
| 38 | 6 | | |
| 39 | 6 | | |
| 40 | 4 | | |
| 41 | 3 | | |
| 42-$Q^3$ | 4 | | |
| 43 | 11 | | |
| 45 | 3 | | |
| 46 | 7 | | |
| 48 | 2 | | |
| 50 | 4 | | |
| 51 | 2 | | |
| 52 | 2 | | |
| 53 | 3 | | |
| 54 | 1 | | |
| 58 | 1 | | |
| 59 | 1 | | |
| 63 | 1 | | |
| 73 | 1 | | |
| 76 | 1 | | |

This table means that the retardation in this group of villages ranges from 2 per cent to 76 per cent, the midpoint of the series of medium being 32 per cent and the two quartile points which include the middle half of the series being 22 per cent and 42 per cent respectively. Reading across the top line, the table is interpreted as follows:

Two per cent slow progress is reported by one village.

Zero per cent of pupils retarded two years or more is reported by 23 villages.

The second line means that 5 per cent slow progress is reported by one village, and one village reports 1 per cent of pupils retarded two or more years. It should be emphasized that the particular percentage of retardation which happens to be the median of such a table is by no means the normal amount of retardation which should be expected, or which would represent satisfactory school conditions. Slow progress percentages reported by cities and villages in New York State, May 1917, are shown in Table 5.

**Correlation with Other Factors.**—A complete study of retardation should show conditions relating not only to the retardation of pupils but should give this information in connection with the health of the pupil, and with his ability to perform the now thoroughly tried and permanently established standard classroom tests used by modern superintendents as a part of their regular supervisory program. It is interesting to note in Table 5, that average pupils are by no means confined to those having physical defects, but that in this single illustration a large majority of the pupils with physical defects are of normal age and even underage.

**School Retardation and Mentality.**— The fact that a pupil may have started school at the age of seven or eight instead of six years or that he may have required an extra year to place him in a given grade does not in any way prove or indicate that there is anything the matter with his mind, as either or both of these circumstances may obtain in the case of a pupil of normal intelligence. Retardation in school is by no means synonymous with mental subnormality. Some of the factors contributing to retardation in school are the following:

*a* The late entrance of pupils into the first grade.

*b* Varying practice in promoting children into and out of the first grade.

*c* Different standards of promotion from grade to grade.

*d* Differences in the health of pupils while at school.

*e* Varying degrees of regularity of attendance.

TABLE 5.

PROGRESS PERCENTAGES OF 286,207 PUPILS IN 41 CITIES, 29 VILLAGES AND 493 UNION FREE SCHOOL DISTRICTS.

| GROUP | Pupils | | | | Per cent | | | |
|---|---|---|---|---|---|---|---|---|
| | Rapid | Normal | Slow | Total | Rapid | Normal | Slow | Total |
| Less than 100 | 987 | 6,724 | 3,732 | 11,443 | 8.62 | 58.76 | 32.62 | 100 |
| 100– 199 | 1,078 | 11,090 | 6,183 | 18,351 | 5.82 | 60.8 | 33.352 | 100 |
| 200– 299 | 864 | 11,574 | 6,541 | 18,979 | 4.56 | 61. | 34.44 | 100 |
| 300– 499 | 1,271 | 13,674 | 7,104 | 22,049 | 5.77 | 62. | 32.23 | 100 |
| 500– 599 | 2,217 | 17,566 | 9,965 | 29,748 | 7.3 | 59.3 | 33.4 | 100 |
| 1000–1999 | 3,123 | 18,118 | 9,691 | 30,932 | 10.09 | 58.57 | 31.33 | 100 |
| 2000–2999 | 2,681 | 10,937 | 6,071 | 19,689 | 13.61 | 55.5 | 30.83 | 100 |
| 3000–4999 | 4,483 | 18,361 | 8,389 | 31,233 | 14.35 | 58.79 | 26.86 | 100 |
| Over 5000 | 10,424 | 66,375 | 26,984 | 103,783 | 10.04 | 63.96 | 26. | 100 |
| Total | 27,128 | 174,419 | 84,660 | 286,207 | 9.48 | 60.94 | 29.58 | 100 |

*f* Different degrees of familiarity with the English language.

*g* Differences in the mentality of normally intelligent children.

*h* The presence of mentally subnormal children in regular classes.

*j* Physical defects of children.

*k* Differences in the maturity of children.

*l* Differences in the home environment of children.

*m* Differences in the amount of time which children may devote to the preparation of lessons outside of school.

*n* Circumstances incident to the moving of families from place to place.

*o* The transfer of pupils from one school to another and from parochial to public schools within a city.

*p* Differences in the type of pupil left in the system when others have been removed.

*q* Differences in the extent to which communities offer inducements for pupils to leave school.

Rochester, N. Y., considerable attention has been given to the preventive and remedial measures used by elementary teachers against retardation. It is significant to note that where teachers have reported in detail their efforts to reduce retardation, they have enumerated measures all of which should be employed by every good teacher in her regular work with normally successful pupils as well as with those in danger of non-promotion. There is indeed little doubt that the most effective way to reduce retardation is to improve the teaching itself, and this is already the superintendent's constant problem.

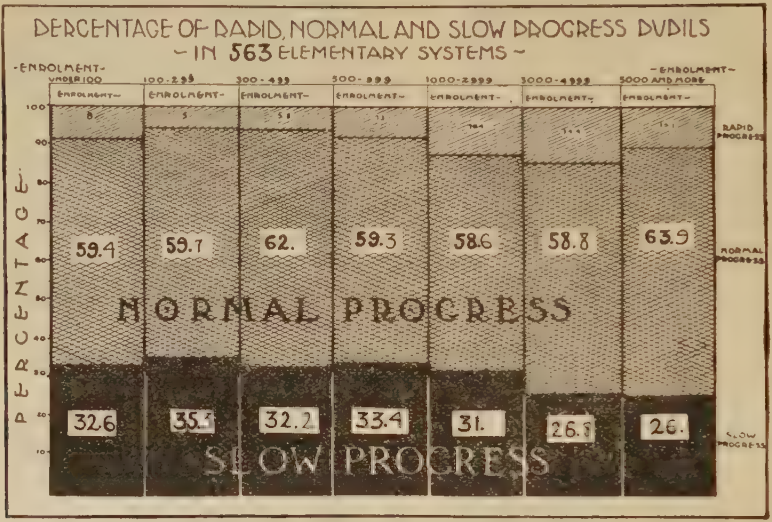

TABLE 6.

UNDER, NORMAL AND OVERAGE AND PHYSICAL DEFECTS.

| GROUP OF PUPILS | Without physical defects | With physical defects | Total | Percentages | | |
|---|---|---|---|---|---|---|
| | | | | Without defects | With defects | Total |
| Underage.... | 22 | 79 | 101 | 4.2 | 15.2 | 19.4 |
| Normal age.. | 69 | 258 | 327 | 13.3 | 50.0 | 63.3 |
| Overage..... | 21 | 69 | 90 | 4.0 | 13.3 | 17.3 |
| Total... | 112 | 406 | 518 | 21.5 | 78.5 | 100 |

Variations in pupils' progress through school and variations in the mentality of children are shown in Figs. 5 and 6, from which it is clear that the factors listed above combine to bring about the result that while there appear to be actually more bright children than dull children, there are relatively fewer who make rapid progress through school than the proportion making slow progress.

**Preventive and Remedial Measures.**— The query naturally arises, now that we have this information about non-promotion, What is to be done about it? In several places, notably in

Many cities have certain features in their organization, which, entirely apart from the effort to improve the effectiveness of the instruction in the regular classroom, make it easier to grapple with the retardation problem and have been of material assistance in reducing its effects. These special features in the organization of the school and of the whole local system do not apply to pupils who are making normal or rapid progress but to retarded pupils and those in danger of non-promotion, and for this reason they may be called preventive and remedial measures with more propriety than those which ought to be a feature of the effective and successful teaching of all pupils. A list of some of these measures is given by way of illustration.

**1. Primarily Concerning the Teaching.**— A. Those which allow the pupil repeating the grade to remain with the class which is regularly taking the grade for the first time. The remedial work is performed by the teacher in the course of her regular instruction and the retarded pupil is supposed to have the chance of finishing the grade with the rest of the class.

B. Those which involve the services of an assistant working in the classroom with the regular teacher.

C. Those which involve a temporary transfer to a special class and a prospective return to the regular grade in time to complete it with the class at the close of the term.

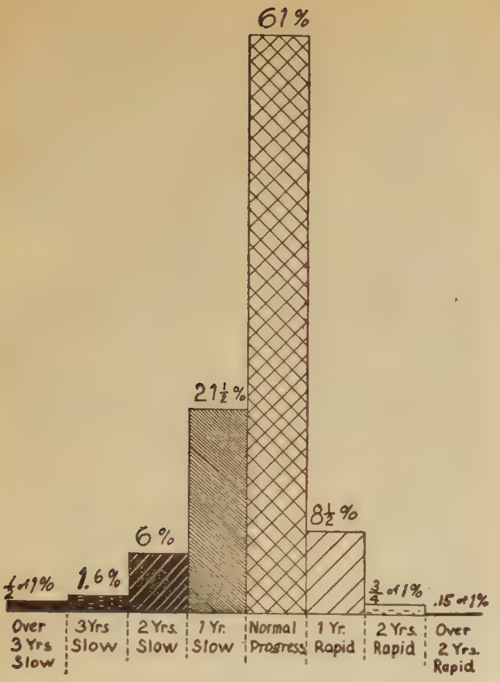

FIG. 5.

Rapid, normal and slow progress of 286,207 elementary pupils in 563 public school systems in New York State.

This figure shows where the schools have the children located with reference to the normal advancement of one grade a year. Note that relatively a larger number of pupils are found on the slow side of the normal than in the portion of the diagram representing rapid pupils.

D. Those which involve a transfer to a special class with a return to regular work some time after the class from which the transfer was made has completed the work of that grade.

(1) Ungraded classes.
(2) Foreign classes.
(3) Special catch-up classes.
(4) Classes for atypical pupils.
(5) Open-air classes.

E. Those which involve the substitution of a modified, though regularly graded, course of study in place of the regular elementary curriculum.

F. Those which involve a transfer to another sort of school or institution which substitutes a special curriculum for that of the graded school.

**2. Primarily Concerning the Administration of the School.**— Those which relate to the principal's office and to the school district as a unit rather than to the instruction in the classroom. The keeping and actual use of special individual records of scholarship, health and standard test results; special features of organization within the school and of co-operation with the home.

**3. Primarily Concerning the Administration in the Entire Local School System.**— Those which relate to the department as a whole and to co-operation with other city departments and organizations. Analysis of retardation records of schools and use of data in the supervisory program. Employment of clerk or establishment of a bureau of research and educational measurement. Co-operation with all city departments having to do with children. Study of the methods used in other cities of comparable size.

**Retardation Survey.**— In order to make a study of this problem in a school system, it is necessary to obtain for each pupil enrolled the following information:

1. The date of birth.
2. The date of entrance into the first grade (not kindergarten).
3. The number of terms (one-half years) of schooling received and grades or half grades completed in each of the following school locations:
   *a* School where registered.
   *b* Other local public schools.
   *c* Local parochial or private schools.
   *d* Any schools in other cities.
   *e* Schools in foreign countries.
4. Grades or half grades skipped or doubly promoted.
5. Grades repeated or doubly repeated.
6 Note of extraordinary circumstances favorable to progress.
7. Note of extraordinary circumstances unfavorable to progress.

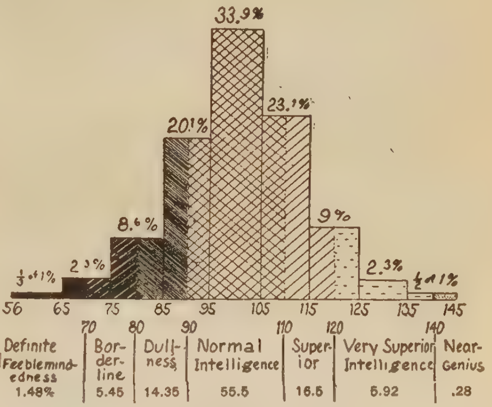

FIG. 6.

Intelligence distribution of 1000 unselected children.

This figure should be examined in connection with figure 5. Note that so far as the children's minds are concerned: (1) the number below normal is considerably less than the proportion of children whose progress through school is below normal as shown in figure 5, and (2) that the number of children who appear in any way to be mentally slow is more than counterbalanced by the number of children of corresponding degrees of mental superiority. This is in marked contrast to the relatively few children who are making rapid progress through school. This figure is a modified form of a diagram in "The Measurement of Intelligence" by Lewis M. Terman, published by the Macmillan Company and reproduced here with the permission of the author and the publishers. Together figures 5 and 6 would appear to show that there is considerably more trouble with the children's schooling than there is with their minds, and that whatever is the matter with their schooling is quite out of proportion to anything wrong with their minds.

The most effective manner of assembling retardation data in the tables is to resort to the mechanical tabulation of these statistics by means of electrical sorting and tabulating machines, in which process a small card containing all the necessary information is punched for each pupil. These cards are then run through the machines any desired number of times in order to make sortings based upon the different angles from which the situation is to be viewed.

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**RETENTIVENESS,** a quality of memory by which the after-effects of mental process are long held, with capability of reproduction. Retention is of primary importance in judgment, particularly in the study of processes that are continuous, or in which there is a continuity of interest. Thus when one hears a succession of sounds and judges that the second, for instance, is louder than the first, the property of retention, by which the after-effect of the hearing of the first sound is compared with the second, is of great importance. In many this attribute of retentiveness is weak, seriously impairing their judgment. See Judgment; Memory and its Disorders.

**RETHEL,** rā'tĕl, **Alfred,** German painter: b. Aix-la-Chapelle, 15 May 1816; d. Düsseldorf, 1 Dec. 1859. He studied at the Academy of Düsseldorf (under W. Schadow) and afterward at Frankfort (under Philip Veit and Schwind). Here he painted ‘The Resurrection of Christ’ (in the church of Saint Nicholas), ‘Daniel’ (in the city museum) and ‘Justice Pursuing a Fleeing Murderer.’ When there was a competitive exhibition held of designs for frescoes in the town-house of Aix-la-Chapelle representing incidents in the life of Charlemagne, he was chosen to do the work, and lived to complete four of them; the other four being executed from his designs after his death. These are considered the finest productions of his brush. He painted in water-color a series of pictures illustrative of ‘Hannibal's Passage of the Alps,’ which were afterward reproduced by wood engraving. In 1848 he executed his ‘Dance of Death,’ and drew a number of designs on wood. His style was notable for grandeur and energy, and his frescoes are among the finest modern examples of that style in Europe. In 1852 he was seized with a nervous affection for which he sought relief by traveling, but died insane.

**RETIARIUS,** rē-shĭ-ā'rĭ-ŭs, a netman, that is, a Roman gladiator who wore a short tunic and carried a trident and net, with which he endeavored to entangle and dispatch his adversary, who was armed with helmet, shield and sword.

**RETIF DE LA BRETONNE.** See Restif de la Bretonne, Nicholas Edmé.

**RETINA.** See Eye.

**RETREAT, Spiritual,** or **RETREAT,** in devotional language, a season of retirement from ordinary secular occupations and of prayer, of meditation upon the truths of religion and the duties of the Christian life, of examination of the conscience, of serious consideration of one's spiritual state, etc. The retreat is also called the spiritual exercises, that being the name given to it by Saint Ignatius de Loyola, whose plan of the exercises (*Exercitia spiritualia*) has ever since his day been the directory of the spiritual retreat. The exercises are arranged for a retreat of four weeks, but usually the time is abridged to 10 days or a week. See Spiritual Exercises, The.

In military language, a retrograde movement, whether forced or strategical, by which troops retire before an enemy: it differs from a flight in being orderly and under control. An army in retreat must be covered by a powerful rear-guard, which from time to time must, if the enemy is pursuing, hold the pursuers at bay, while the artillery and the baggage pass defiles, cross streams or overcome any obstacles.

**RETRIBUTION,** *in anthropology* and *in law*: in anthropology the retribution theory expresses the belief in states of happiness or of misery in another world, allotted to men according to their deserts while living on earth. Tylor (‘Primitive Culture,’ Chap. 13) does not find this idea existing universally in the religions of the lower range of culture that have not been affected by contact with higher religions. The most primitive view of the life beyond the grave was, he holds, that it is simply a continuation of the present; to this succeeds the belief that excellence, valor, social rank, etc., modify circumstances and surroundings in the next life; out of this, he believes, was finally developed a doctrine of future rewards and punishments.—*In law,* the theory of retribution, or retributive theory is, that punishment is inflicted in retribution for an offense, and ought to be similar to the misdeed: this is the principle of the retribution prescribed in the Hebrew law —«an eye for an eye, and a tooth for a tooth.» In modern legislation deterrence displaces retribution: it is held that no more punishment should be inflicted than suffices to deter others from committing the offense: even the death penalty is not defended on the principle of «life shall go for life,» but because with abandoned criminals capital punishment has a more deterrent effect than has life imprisonment.

**RETRIEVER,** a dog, trained to find out and bring back any killed or wounded game. The two varieties of British retriever differ only in coat. The larger and more familiar breed of retrievers, the wavy-coated, is formed by crossing the Newfoundland and the setter; the smaller or curly-coated breed is formed by crossing the water-spaniel and the terrier. The typical retriever is 20 or more inches high, with a stoutly-built body, strong limbs, webbed toes and black and curly fur. See Dog.

**RETURN OF THE NATIVE, The** (1878), one of the masterpieces of Thomas Hardy and perhaps the best of all his earlier novels, deals with the people in the very centre of his favorite land of «Wessex.» The scene never leaves Egdon Heath, and on this sombre uniting of various real places in the south of England, somewhat to the west of the Isle of Wight, a very intense tragedy is enacted. It is conceived on classic lines, and is simple, clear and fateful. It is a story of the interruption of and sinister effect upon the ordinary life of the people caused by acts of will and wilfulness. Eustacia Vye, one of the most perfectly delineated women in modern English fiction, wishing relief from the *ennui* of the restricted life on the heath seeks diversion in the admiration of Wildeve, but seeing a chance for positive escape in the return from Paris of the «native,» Clym Yeobright, marries him, only to find herself, on the threatened loss of his eyesight, the wife, not of a Paris jeweler, but a day laborer on Egdon. Attempting to flee with Wildeve, both are drowned on the edge of the heath. Meanwhile the course of these events has marred the life of Thomasin, Wildeve's wife, has estranged Yeobright from his mother, and caused the death of the latter. As in many of Hardy's works the wilfulness of one character like a kind of fate operates to disturb and ultimately to upset the lives of several people, and only when Eustacia finally involves herself in the general ruin does life resume its normal though altered course. The tragedy is an extremely vivid and powerful one, although severely localized. It is very richly set in the background of local customs, habits and characters, all of which are given an extraordinary unity and impressiveness through the dominance of Egdon Heath.

William T. Brewster.

**RETURNING BOARDS.** All State governments have provision for the final canvass of votes in State elections by some central authority, known as a returning board, or by some similar designation. The duties of these boards are ministerial, and they have no right to go outside the face of the returns. In the Presidential election of 1876 the returning boards of Florida, South Carolina and Louisiana, controlled by the «carpetbag» and negro element, went behind the returns, and assumed to cast out sufficient votes on the ground of alleged fraud and intimidation to give those States to the Republican electors. A great ferment resulted, and in order to allay the agitation and arrive at a correct conclusion, an electoral commission was appointed, which decided in favor of the Republican candidate, Rutherford B. Hayes. See Elections; Electoral Qualifications; Congress.

**RETZ,** rĕtz, **RAIS,** rāz, or **RAYS,** rāz, **Gilles de Laval de,** French military officer: b. 1404; d. 26 Oct. 1440. He was a Breton of high rank, and distinguished himself under Charles VII in the struggle with the English, fighting by the side of the Maid of Orleans. Subsequently he received the baton of marshal. He retired to his estates, but was brought to trial by the Bishop of Nantes, charged with sorcery and the practice of cruelty in the celebration of demoniac rites. He was convicted and burned. Attempts were once made to find in Retz a historical original of Bluebeard, but, of course, in vain.

**RETZ, Jean François Paul de Gondi,** Cardinal de, French politician: b. Montmirail, 19 Sept. 1613; d. Paris, 24 Aug. 1679. His instructor was the celebrated Vincent de Paul. In 1643 he received a doctorate at the Sorbonne, and was appointed coadjutor of the archbishop of Paris. Although preferring military service he found he could gratify his ambitions in the church and his impassioned eloquence won him the favor of the Parisians. Aiming at political influence he incurred the enmity of Richelieu, and, after his death, of Mazarin. The Fronde, or the party opposed to the court and Mazarin, received the coadjutor as a man whose genius and popularity made him a valuable accession, and De Retz embraced their cause with zeal. The various insurrections of the people and the Frondeurs obliged Mazarin to leave France, whereupon De Retz seemed to have it in his power thenceforth to hold the reins of government. But Mazarin soon returned from his banishment, more powerful than ever. The Fronde, which had never been firmly united, and the members of which, with the exception of Condé and De Retz, were weak and wavering, was dissolved; and soon after the latter, not without the management of his enemy Mazarin, had obtained the cardinal's hat, he was unexpectedly seized and confined in the castle of Vincennes, whence he was subsequently removed to Nantes. Here he found means to escape, and, perpetually pursued by officers of Mazarin, wandered for eight years through Europe. After the death of Mazarin in 1661 he was allowed to return to France, after having promised never to take part again in political combinations. He now resigned his archbishopric, governed the abbey of Saint Denis, lived retired, restricted his wants, paid his immense debts, and distributed pensions to his friends. Reconciled with all parties he lived the retired and quiet life of a philosopher. His posthumous 'Mémoires' (1718) give an interesting picture of his character. They were praised by Voltaire and were drawn upon by Dumas for contemporaneous pictures in his 'Vingt Ans Après.' The best edition of his works is that in the 'Grands Ecrivains de la France' series (1872–90). An abridged edition was published in 1865 in one volume. Consult Chantelauze, 'Le Cardinal de Retz, Etude historique' (1878); 'Le Cardinal de Retz et ses Missions diplomatiques à Rome' (1879).

**RETZSCH,** rĕtsh, **Moritz,** German artist: b. Dresden, 9 Dec. 1779; d. Holflossnitz, near Dresden, 11 June 1857. As a painter his subjects were taken largely from German and Greek mythology and display beauty in drawing and color. Retzsch's illustrations of the great poets, comprehending the drawings executed by him for editions of Goethe's 'Faust,' and the works of Schiller and Bürger, have rendered him deservedly famous. He executed a 'Shakespeare Gallery' consisting of 80 plates. In 1824 he was appointed a professor in the Art Academy at Dresden. His illustrations of poetry and legend were done in outline and are distinguished by exquisite delicacy and refinement of form and expression.

**REUCHLIN,** roikн'lin, **Johann** (Hellenized Kapnio), German Hebrew scholar and humanist: b. Pforzheim, Baden, 22 Feb. 1455; d. Liebenzell, 30 June 1522. The excellence of his singing procured him a place in the chapel of the Margrave of Baden, who appointed him traveling companion to his son Frederick, afterward bishop of Utrecht. In 1473 Reuchlin accompanied that prince to Paris, and there studied Greek under Hieronymus of Sparta, besides applying himself assiduously to Latin composition and Hebrew. In 1475 he went to Basel, and after some time spent in the study of Greek began to teach that language, with Latin and philosophy. At this time also he wrote his Latin dictionary ‘Breviloquus, id est Dictionarium singulas Voces Latinas breviter explicans’ (1478), the first published in Germany. In 1478 he went back to France, and studied law at Orleans, while he taught, at the same time, the ancient languages. In 1481 he returned to Germany, and taught law and the belles-lettres at Tübingen. Eberhard, count of Würtemberg, soon after took him, as the best Latinist in Germany, in his train on an embassy to Rome. The Emperor Frederick II created him a noble of the empire in 1492. After Eberhard's death Reuchlin lived several years at the court of Philip, elector of the Palatinate. Here he enriched the Heidelberg library with manuscripts and productions of the new art of printing. He was subsequently appointed president of the court of the confederacy which had been established by the Swabian princes against the encroachments of the house of Bavaria. He was also engaged in translating the penitential psalms, preparing a Hebrew grammar and dictionary, and correcting the translation of the Bible. A converted Jew, John Pfeffercorn, and Hoogstraten, an inquisitor, obtained from the Emperor Maximilian, in 1509, an order that all Hebrew works, the Old Testament only excepted, should be burned, on the ground that they were full of blasphemies against Christ. The emperor, however, consulted Reuchlin, who assured him that these works, instead of injuring Christianity, contributed, on the contrary, to its honor and glory, since the study of them produced learned and bold champions to fight for the honor of the Christian religion, and that to destroy these books would be to put arms into the hands of its enemies. The order was thereupon recalled, but the war of pens raged for 10 years. Passages were extracted from Reuchlin's works and their meaning perverted; on the ground of which a charge of heresy was brought against him. He was summoned in 1513 before the Inquisition at Mainz, presided over by Hoogstraten, and by a decree of that tribunal his writings were consigned to the flames. This roused the indignation of the friends of classical literature, and an appeal was made to Pope Leo X, who referred the whole matter to the Bishop of Spires. That prelate declaring Reuchlin innocent, ordered the monks to pay the expenses of the investigation. A counter appeal was made by Hoogstraten; but Reuchlin was then acquitted by a commission of prelates held at Augsburg in 1516; and the pope issued a mandate that all proceedings against Reuchlin should be stopped. In the course of this contest appeared the ‘Epistolæ Obscurorum Virorum,’ in which the enemies of Reuchlin were ridiculed. When, in 1517, he received the theses propounded by Luther, he exclaimed, «Thanks be to God, at last they have found a man who will give them so much to do that they will be compelled to let my old age end in peace.» In 1518 he was appointed professor of Hebrew and Greek at Wittenberg, but sent his nephew Melanchthon instead, and William of Bavaria appointed him professor in the University of Ingolstadt. Although suspected of a leaning toward Protestanism, he never left the Roman Catholic Church. Consult Geiger, ‘Johann Reuchlin: sein Leben und seine Werke’ (1871); Geiger, L., ‘Johann Reuchlins Briefwechsel’ (1875); Horawitz, A., ‘Zur Biographie und Korrespondenz J. Reuchlin’ (1877); Holstein, H., ‘J. Reuchlins Komödien’ (1888); Hirsch, L. A., «Johann Reuchlin» in ‘A Book of Essays’ (New York 1904).

**RÉUNION, Isle de la,** ēl dė lā̆ rā-ü-nē̄-ôṅ, or **ISLE OF BOURBON,** in the Indian Ocean, about 400 miles east of Madagascar, a French insular colony, with an area of 970 square miles, its length being 45 miles and breadth 33 miles. It was discovered by Mascarenhas, a Portuguese, in 1545, who called it by his own name. The French took possession in 1649 and gave it the name of Bourbon. It was captured by the British in 1810 and restored to France in 1815. The island is of volcanic origin, composed of two enormous volcanic mountains, in one of which the fire is extinct; the other is still in activity. The loftiest summit, Le Piton de Neige or the Snowy Pike, is about 10,000 feet above the level of the sea. The climate is excessively hot from November to April; the evenings, however, are refreshed by the sea breezes, and the mornings by the land breezes. The capital is Saint Denis, a pretty town; pop. 23,972. Other urban centres are Saint Pierre (29,481), Saint Paul (18,646) and Saint Louis (13,346). The towns are under French municipal law. The island has a lycée with 25 teachers and 350 pupils. There are 163 elementary schools with 373 teachers and 15,837 pupils. The chief port, Pointe-des-Galets, is connected by a coast railway of 80 miles with Saint Benoit on the one hand and Saint Pierre on the other. In 1888 this railway was taken over by the state. The total value of imports in 1916 was $4,679,413, and of exports, $6,634,901. In the same year 91 vessels of 216,638 tons entered and 92 vessels of 220,054 tons cleared at the ports of the island. The public debt is about $900,000. The principal articles of export are coffee, sugar, vanilla, gums, lichens for dyeing, cotton, hides, etc. Sugar is by far the most valuable export; vanilla comes next. Commerce is impeded by the want of good harbors. The population consists of 173,822, comprising 159,218 Euopeans, 8,341 British Indians, 1,868 natives of Madagascar, 2,927 Africans, 884 Chinese and 584 Arabians. Here, as elsewhere, the French have not shown themselves successful colonizers. It would appear that only the British, Americans and Russians possess this faculty to any high degree.

**RÉUS,** rā'oos, Spain, in the province of Tarragona, is an important railway station and a progressive town, with a port at Salou on the Mediterranean, four miles distant. It has excellent schools and model public institutions. Its importance as a commercial centre has incrased in a marked manner during the last quarter of a century. Its export houses represent great local industries in the agricultural products of flour, wine and fruit.

**REUSCH,** roish, **Friedrich,** German sculptor: b. Siegen, Prussian Westphalia, 5 Sept. 1843. He received lessons at the Berlin Academy, and afterward from Albert Wolff. In 1874 he traveled in Italy for purposes of study, and on his return executed some military statues for Siegen and Bensberg, and a group in marble for the Belle Alliance bridge at Berlin. A lucky inspiration was his ‹Demon of Steam.› This spirited and highly original work was modeled in 1880, and subsequently cast in bronze and set up in the Scientific High School at Charlottenburg. He became teacher in the Art Academy of Königsberg (1881), and meanwhile executed numerous busts and statues for public buildings; the monuments of Vessel, the astronomer, and Jacobson, the oculist; the sepulchral monument of General Bronsart von Schellendorf, and the colossal figure of Emperor Wilhelm I in his coronation robes which stands in front of the palace (1894). Of his imaginative works the most notable are ‹Psyche Appeasing Cerberus›; ‹Cupid Putting on the Helmet of Mars›; and the ‹Triumph of Cupid over Hercules.›

**REUSS,** Germany, formerly two central principalities somewhat intermingled with and lying between Saxony and Bavaria, now a part of the Republic of Thuringia. Total area of both districts, 441 square miles, mostly mountainous. The former territory of the older line, Reuss-Greiz, consists of the districts of Greiz and Burgk, and has an area of 122 square miles. These districts are separated, one being traversed by the White Elster, while the other lies along both banks of the Saale. The surface is better adapted for pasture than agriculture, rearing great numbers of horned cattle and sheep, but scarcely raising grain sufficient to meet the consumption. The most important crops are potatoes and flax; hops also are an important crop. The weaving of woolen, linen and cotton fabrics is also among the principal occupations of the people. The capital is Greiz, and the only other town is Zeulenroda. The territories of the younger line, the former principality of Reuss-Gera-Schleiz-Lobenstein-Ebersdorf, have together an area of 319 square miles. These territories are, on the whole, fertile and well wooded, raise sufficient grain to supply the consumption and possess among their minerals marble, salt and iron. The capital is Gera, and other towns are Schleiz, Saalburg, Hirschfeld and Lobenstein. The division into an older and a younger branch dated from 1616. From 1668–1918 all the princes of both lines were called Heinrich (Henry). The great majority of the inhabitants are Protestants. Reuss according to the census of 1919, had a population of 212,007, of which number 97,995 were males and 114,012 were females.

**REUSS,** Switzerland, a tributary of the Aar, rising on the north face of the Saint Gothard, flowing north past Andermatt and Amsteg, between which places its course is through a wild and narrow gorge, spanned by the Devil's Bridge and other wonders of Swiss roadmaking, and entering the south end of the Lake of Lucerne. This it leaves again at its north end, at the town of Lucerne, and still going nearly due north, reaches the Aar near Windisch (Aargau). Its length is 90 miles.

**REUTER,** roi'tĕr, **Fritz,** German dialect poet and story writer: b. Stavenhagen, Mecklenburg-Schwerin, 7 Nov. 1810; d. Eisenach, 12 July 1874. He studied law at the universities of Rostock and Jena, and in 1833 was condemned to death at Berlin for his share in a students' democratic society. His sentence was, however, commuted by the king to 30 years' imprisonment. Till 1838 he was a close prisoner in various Prussian fortresses, and after a farther period of confinement in the Mecklenburg fortress of Dömitz was set free in 1840. For 10 years he devoted himself to farming but in 1850 became a private teacher in the Pomeranian town of Treptow. In 1853 he was made famous by the publication of humorous poems in the Platt-Deutsch dialect, entitled ‹Läuschen un Rimels› (new series, 1858). These were followed by ‹Polterabendgedichte› (1855) and ‹Reis' nah bellegen› (1855). His later works comprise ‹Kein Hüsung› (1858); a tragical village story in verse; ‹Hanne Nüte und de lütte Pudel› (1859); ‹Schürr-Murr› (1861), a collection of tales in both Low and High German; and ‹Olle Kamellen› (1860–68), his chief prose work, a series of tales in Platt-Deutsch, including ‹Ut de Franzosentid› (1860); ‹Ut mine Festungstid,› an account of his conviction, and imprisonment (1862); ‹Ut mine Strontid,› his masterpiece (1864); ‹Dörchlauchting› (1866); and ‹De Reis' nah Konstantinopel› (1868); ‹Die Drei Langhäuse› (1878), a satirical play; ‹Lustspiele und Polterabendgedichte› (1883); and ‹Reuter-Reliquien› (1885). Reuter's stories are lacking in plot, but are marked by clever episodes, skilful character drawing and a humor, which, despite the difficulty of his medium, was universally appreciated in Germany. An edition of his works appeared in 1863–68, and in 1875 two volumes of ‹Nachgelassene Schriften,› with biography, were added by Wilbrandt. Consult Ebert, H., ‹Fritz Reuter, sein Leben und seine Werke› (Güstrow 1874); Gädertz, K. T., ‹Aus Fritz Reuters jungen und alten Tagen› (2d ed., 3 vols., Wismar 1897–1901); Glagau, O., ‹Fritz Reuter und seine Dichtungen› (2d ed., Berlin 1875); Römer, A., ‹Fritz Reuter in seinem Leben und Schaffen› (Berlin 1895); Thurber, C. H., ‹Fritz Reuter› (Boston 1914).

**REUTER, Paul Julius,** BARON, German telegraph promoter: b. Cassel, Germany, 21 July 1816; d. Nice, France, 25 Feb. 1899. He settled in Aix-la-Chapelle in 1849, where he first established his system of transmitting news by telegraph to the leading towns on the Continent, and in 1858 removed to London, where he undertook to supply the English newspapers with foreign news. His enterprise, known as «Reuter's Agency,» occupied a unique field and grew in importance from year to year until it is now in operation in all parts of the world. In 1865 he obtained the permission of the government to lay a cable from England to Cuxhaven, and shortly after to lay one between France and the United States. In 1872 the shah of Persia granted to him the exclusive rights of constructing railways, farming customs and control of the natural resources of the country, but later exchanged these privileges for that of establishing the bank of Persia. He was created baron by the Duke of Saxe-Coburg-Gotha in 1871.

**REUTER AGENCY,** an English news service opened in London by Julius Reuter in 1858, and now the most important institution of its kind in the British Empire. It has correspondents in all the great news centres of the world and furnishes telegraph and other news features throughout the eastern hemisphere and, to some extent, to Latin America, the United States and Canada. See Press Associations; Reuter, Paul Julius.

**REUTERDAHL**, roi'tėr-dal, **Henry**, American naval artist: b. Malmo, Sweden, 12 Aug. 1871. He received his academic education at Stockholm, Sweden, and after remaining in this country served as newspaper correspondent during the Spanish-American War. He has contributed to various prominent periodicals in this country and England, and illustrated the ‹History of the New American Navy› (1903) by John D. Long (q.v.).

**REUTLINGEN**, roit'lĭng-ĕn, Germany, in Würtemberg, capital of the circle of the Schwarzwald or Black Forest, on the Echaz, affluent of the Neckar, 20 miles south of Stuttgart. The church of Saint Mary is of great antiquity (13th century), and its tower, 325 feet high, of Gothic type, considered the most beautiful in the kingdom. The environs of the town are most romantic. Its leather and textile industries are important.

**REVEILLÉ**, rĕ-vāl'yĕ, or rĕv-ĕ-lē', the signal given in camp and garrison at break of day, by beat of drum or sound of bugle, for the soldiers to rise and begin the duties of the day.

**REVEL**, rĕv'ĕl, or **REVAL**, rĕv'ăl, capital of the Republic of Esthonia, on a small bay of the same name, 238 miles southwest of Petrograd. The ancient part of the city on a rocky eminence is surrounded by Gothic walls and contains the cathedral, castle, governor's residence, high school and aristocratic quarters; other churches, the town-hall, several fine halls, schools, etc., are located in the lower, or commercial town. There are two harbors: mercantile and naval. Commerce is comparatively unimportant. Flax, linseed, grains, skins and potato brandy are exported; salt, wine, fruits and manufactured and colonial goods imported. Pop. about 68,000.

**REVELATION**, *in theology*, the communication of truth by God to men; also, the truth so conveyed, and especially in the Scripture. There is a revelation of God's will and his purposes made through man's reason and the voice of conscience: Nature everywhere reveals God's attributes — his power, his goodness, his wisdom, his providence; so, too, the history of the tribes of mankind upon the earth affords proofs of divine governance. But the most express revelation of God's purposes toward man is made in the written word, in the record of special divine communications made in time past to holy men «who spake as they were moved by the Holy Spirit»; and this written word is the key to all the other revelations of the divine nature and the divine will. See Inspiration; Bible.

**REVELATION OF JOHN.** The last of the canonical books of the New Testament.

**General Character.**— The book, as its name implies, purports to be a *revelation* (ἀποκάλυψις, an «uncovering») or unveiling of the secrets of the divine purpose in reference to God's Kingdom on earth in its conflict with the forces of evil. As such, it is one of a large number of Apocalypses that were published, first in Jewish circles and later the early Christian Church within the period from about 200 B.C. to 200 A.D. While most of these works were probably quite popular and circulated widely, only two, the book of Daniel in the Old Testament and the Revelation of John in the New, became canonical. The chief characteristics common to all apocalyptic works are (1) the communication of the inspired information to the seer by means of visions, or dreams, or similar ecstatic experiences by which the seer was brought into immediate contact with transcendental scenes (heaven, the throne of God, angels, etc.); (2) the use of symbolism (numbers, beasts, the sea, mountains, etc., figuratively representing individuals, kingdoms and other realities); and (3) the attempt to forecast the course of world-history from the time of the author to the «end»; in other words, to work out a program of the future and especially of the last times, which were usually thought to be very near at hand. All of the known Jewish Apocalypses were pseudepigraphic, the revelations being asserted to have been received by Enoch, or Noah, or other ancient worthies, thereby giving the work the prestige belonging to great antiquity and to a famous name. Even the Daniel Apocalypse, written about 165 B.C., was assigned to a Daniel supposed to have been living about 400 years earlier. The Christian apocalyptists were not all bound by this traditional practice. At least two, John, the author of the New Testament book, and Hermas, the author of ‹The Shepherd› (c. 150 A.D.), issued their works under their own names. It is evident, from the facts stated, that Revelation is unlike any other New Testament book and must be viewed and interpreted, in general, in harmony with the principles of interpretation that hold for all the works of the class to which it belongs.

**Special Character of the Book.**— Revelation, though one of many Apocalypses, is the most individual of them all. Its many special characteristics serve to put it in a class by itself. It is addressed by the author, John, to a definite group of seven churches, all in the Roman Province of Asia. No other Apocalypse is so openly and specifically addressed to actual readers. It was expected that it would be read and its message heeded. The circumstances which occasioned the message are, in part at least, also clearly indicated. The churches were in danger. From without, because they were undergoing persecution. Some Christians had already been martyred and a general persecution seemed imminent. Within, the sins of apostasy, immorality or corruption of doctrine seemed to be assuming threatening proportions. But it was not simply with such concrete facts that Revelation sought to deal. The seer was given to know what lay behind or was involved in these things. The persecution of the Christians was, to him, more than merely the work of the civil authorities, or of the state (the imperial Roman government). It was, in the last analysis, the work of Satan, the arch-enemy of God and of all good, the Anti-Christ, the head of legions of evil angels, whose earthly rule was carried on through the institutions, political and religious, of the pagan Roman Empire. Of these institutions, the one that more significantly than any other gave expression to the union between Satan and the empire was that of the worship of the emperor. To the seer this was, in principle, the worship of Satan, it was Satan's means of receiving the homage of mankind. But just as in the institutions and practices of pagan imperial Rome Satan's earthly kingdom was concretely embodied, so in the Church — the unity spiritually existing in the numerous small Christian communities of Asia and elsewhere — nothing less than the Kingdom of God and of His Christ was concretely embodied, and the issue, as thus perceived by the seer, was in reality the issue between Satan and God, between heaven and hell, good and evil. What was transpiring on earth was therefore of universal, cosmic and eternal significance. This theme, one common to apocalyptic literature, is applied and developed in Revelation with a consistency and clarity, a dignity and sublimity, a force and pathos that places this book far above all others of its class.

**The Plan of Revelation.**— The book consists of two unequal parts: (1) The letters to the Seven Churches of Asia (i, 3; iii, 22); (2) The Apocalypse proper (iv–xxii). The first three verses serve as a brief explanatory introduction to the whole book, indicating the source and authority of the contents which are expressly stated to be a «revelation» and a «word of prophecy» concerning things which must *soon* take place.

The letters are nominally from John to the seven churches. In reality they claim to be a message from the eternal God, the «seven spirits before His throne» and from Jesus Christ, the head of the Church, who is soon about to come again (i, 3–8). John describes his vision of Jesus who commanded him to write (i, 9–20) and then gives in detail the message to each of the seven churches (chs. ii and iii). From these messages, with their particular references to the circumstances of each church, we learn what the conditions were that suggested the great Apocalyptic drama that follows.

The Apocalypse proper (iv–xxii) opens with a vision of God on His throne, with His heavenly court, ineffably glorious, worshipping and adoring Him (ch. iv), holding in His right hand a seven-sealed book (the book of destiny) which the Lamb (the crucified and glorified Jesus) alone is able to unseal. To the Lamb the whole heavenly court ascribe all praise (ch. v). The dramatic action of the Apocalypse begins with the opening of the seven-sealed book of destiny, seal by seal (ch. vi). Between the unsealing of the sixth and seventh seals there is a pause, full of meaning (ch. vii). The breaking of the seventh seal introduces a second series of signals, seven trumpet-blasts (ch. viii), each blast being followed by some event of ominous portent. The fifth and sixth trumpet-blasts also usher in the first and second of three great woes destined to come upon mankind (ch. ix). Then comes another significant pause. A little book (of prophecy?) is given the seer by an angel and the seer devours it (ch. x), after which he measures the Temple, except the outer court, which is to be given over to the Gentiles, and is told of the two witnesses and their fate and the calamities that are to follow it, making up the second woe (xi, 1–14). The blast of the seventh trumpet brings the great announcement «the Kingdom of Christ has come to pass,» at which heaven rings with praise (xi, 15–19). From now on the theme centres about the great judgment-crisis in its various stages. First, however, we are let into the secret of the great issues at stake. Such is the real significance of chs. xii–xiv. It was necessary to explain this before describing the great judgment. The seer sees a woman about to bear a son, which a great dragon is waiting to kill as soon as born. But the child is caught up to God and saved. The dragon pursues the woman but she escapes. War ensues in heaven and the dragon and his hosts are defeated and cast down to earth. The real victory has been won, but the dragon continues the conflict on earth (ch. xii). The two beasts of ch. xiii are the dragon's agents on earth by whom he seeks to keep control of mankind. But he is opposed by the Lamb, head of the armies of heaven, whose impending triumph is forecast in announcements of angels (xiv, 1–20). Now come the seven last plagues poured out by seven angels from seven bowls full of the wrath of God and culminating in the great judgment on «Babylon» (xv-xviii). These are fittingly introduced by a hymn of the victors over the beast (xv, 1–4), then described in detail (xv, 5–xvi, 21), the climax being reached when the great harlot, the earthly representative of the kingdom of Satan, the deadly enemy and persecutor of the Church, is utterly destroyed (xvii–xviii). The final acts of the great drama now take place. Of these, the supremely significant one is «the marriage of the Lamb,» as is indicated in the announcement in xix, 1–10. But preceding this a final disposition must be made of the beast and the dragon, who are overthrown and at last, after a 1,000-year interval, subject to eternal punishment (xix, 11–xx, 15). Then appear the new heaven and the new earth, the marriage of the Lamb takes place and the new type of existence begins (xxi, 1–xxii, 5). The conclusion (xxii, 6–21) repeats in fuller form the urgent appeal and solemn warning of the introductory section of the book.

**The Unity of Revelation.**— The development of the theme is, on the whole, so consistent and straightforward that the book must be considered the work of one mastermind. The general uniformity in style throughout the book leads to the same conclusion. But the author was not the creator of the entire material of the book. He drew heavily on the Old Testament, especially on Ezekiel, Zechariah, and, above all, Daniel. He used these as quarries whence to get stones for his new building. But never is he a mere imitator or slavish copyist. He probably had access to other Apocalyptic material, symbolism, calculations, etc., which is no longer extant. In using all this variety it is not surprising that he should have found some of it difficult to manage and work up in perfect agreement with his general plan.

**The Symbolism of Revelation.**— Much of the symbolism used by the author was common to Apocalyptic tradition and some of it may have belonged originally to ancient Babylonian or Persian mythology and superstition without our author being aware of the fact. He took what was at hand and filled it with a new meaning or gave it a new application. The

*Christian* element in the symbolism of Revelation is probably for the most part due to the author. The more important symbols of chs. xii, xiii and xvii are to be interpreted as follows: the woman of xii, 1, is probably the true Israel and the child the Christian Church, the offspring of God's own covenant-people, inclusive perhaps of the Messiah Himself (ch. xii, 5). The beast ascending from the sea (xiii, 1) signifies imperial Rome, the seven heads the seven first emperors (beginning with Augustus), the one apparently wounded to death being Nero, the first emperor to persecute the Christians. The «names of blasphemy» refer to the state-religion which culminated in the worship of the emperor. The second beast (xiii, 11ff.) probably represents the organized emperor-cultus, with its priesthoods, to which the Christians were summoned to show allegiance or suffer death. Nero is meant in xiii, 18 by the number 666 (the numerical value of the Hebrew letters spelling *Nero Cæsar*). In ch. xvii imperial Rome is the great harlot. In verse 10 we again have the seven first emperors (as in xiii, 1–3). The beast of verse 11, which «was and is not» yet is himself the eighth, is the same as the wounded head of xiii, 3, namely, Nero, whom legend asserted was destined to reappear and regain control of the empire. In these three chapters, xii, xiii and xvii, the author is apparently making use of material that originally referred to the period of the sixth and seventh emperors (Vespasian, 68–79 A.D. and Titus, 79–81 A.D.), making it do service for the time of Domitian (81–96 A.D.), the eighth emperor, who laid great insistence on the emperor-worship and who made Christianity a crime punishable by death. In this emperor the author saw *Nero-redivivus*, revived as by Satanic power and therefore representing in himself and his government the rule of Satan on earth.

**The Interpretation of Revelation.**— Revelation was a tract for its times and is to be interpreted as such. Its message, as its address, its local color and reference to contemporary events and issues show conclusively, was for its own age. This was the way in which it was probably understood at first, but it soon (as early as Irenæus) was taken to be a phophecy in which the whole future course of the history of the world or of the Church was intended to be sketched. The author thought the end was to come *quickly*. He had no idea of a course of Christian history extending over 20 or more centuries. Consequently all attempts, too many to be enumerated, to find the events of this or any other age, past or future, foretold in Revelation are futile and doomed to failure.

**Date and Author.**— The earliest Christian tradition (e.g., Irenæus, V. 30, 3) asserts that John had his vision near the close of Domitian's reign, i.e., not long before 96 A.D. With this the internal evidence of the book agrees. The expectation of Nero's reappearance (xiii, 3; xvii, 8, 11) and the persecution of the Church together point to the latter part of Domitian's reign and to no other time. Sections that imply an earlier date must be considered as older material used by the author but not entirely transformed. As to the author, criticism has gotten very little beyond the simple statements of the book itself. A certain John, a man prominent in Christian circles in Asia, who felt that his words would carry weight, sent forth this book as a message of comfort, exhortation and warning, to stay and cheer the Church in its trial, to encourage it to endure even unto death, confident that the ultimate victory of Christ its Lord would soon be manifest. Whether this John was an Apostle or was the author of the Fourth Gospel, or the «Elder» of 2d and 3d John are questions which cannot be discussed in this article but will be found fully treated in the literature listed below.

**Bibliography.**— Of modern commentaries, those by Bousset (Meyer series, 6th ed., 1906); Swete, H. B. (London 1909) and Moffatt (in 'Expositor's Greek Testament,' New York 1910), will be found most satisfactory, with full bibliographies. A good brief commentary is that by C. A. Scott ('New Century Bible'). W. M. Ramsey's 'The Letters to the Seven Churches' (London 1904) is full of archæological information. The 'New Testaments Introductions,' by Zahn (New York 1909) and Moffatt (New York 1915) should be consulted.

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**REVELGANJ,** or **GODNA,** India, in Bengal, near the confluence of the Ganges with the Ghagra, has an active local trade. It is famous as the home of Gautama, the founder of Buddhism, who also taught here. Pop. 14,750.

**REVELL,** rẹ-vĕl, **Fleming Hewitt,** American publisher: b. Chicago, 11 Dec. 1849. He was educated in the public schools and established himself as a publisher and editor in 1869. He founded the Fleming H. Revell Company, of which he has been president since 1890. He is a trustee of the New York Life Insurance Company, the Northfield, Mass., Seminary and of Wheaton, Ill., College.

**REVELS, Master of the,** an English court officer, in former times appointed to superintend the revels or amusements, consisting of dancing, masking, etc., in the courts of princes, the inns of court, and noblemen's houses, during the 12 Christmas holidays.

**REVELSTOKE,** rĕv'ĕl-stōk, Canada, city and county-seat in the Kootenay district, British Columbia, 270 miles northeast of Vancouver, on the Canadian Pacific Railway, and near the Selkirk Mountains. It is situated in a mining district and has railway shops, a lumber industry and manufactures beer and cigars. Pop. 3,017.

**REVENTLOW,** rā'vĕnt-lō, **Ernst,** COUNT, German journalist: b. Husum, 1869. He attained the rank of captain in the German navy and afterward engaged in journalism. He was an ardent supporter of Germany's schemes for world dominion which culminated in the European War, and as an editorial writer on the *Deutsche Tageszeitung* advocated extreme ruthlessness, particularly in submarine warfare. He accused United States Ambassador Gerard of being a British spy; but assailed Zimmerman for the plot to form an alliance between Mexico and Japan against the United States. He furiously attacked Germany's leaders for a supposed inclination to yield to the United

States' demands for respect of its rights after the sinking of the *Lusitania*, and the *Tageszeitung* was suspended 25 June 1915. For an attack on Bethmann-Hollweg, accusing him of misleading von Hindenburg, he was sued for slander in 1916. Author of 'Russische-Japanische Krieg' (3 vols. 1904–06); 'Deutschland in der Welt voran' (1905); 'England der feind' (1914); 'Flotte in diesem grossen Kriege' (1915); 'Deutschlands auswärtige Politik, 1888-1914' (1916); 'The Vampire [England] of the Continent' (1916), etc.

**REVENUE,** the income of a nation, derived from taxation in various forms. In England the principal source of revenue is the income tax. In the United States the national government derives its revenue chiefly from tariff duties and internal taxes on alcoholic liquors and tobacco. The revenues of the various States and municipalities are mainly from taxes on land and buildings and personal property. New York and some other States have an inheritance tax which brings in large returns, so that the New York State government is supported almost without direct taxation. So far as the large majority of citizens are concerned, the forms of taxation in the United States are not directly appreciable. In some countries of Europe, revenue is collected by most vexatious methods. In Vienna a small tax is exacted every time the resident of an apartment house goes in or out of the building between 10 P.M. and 6 A.M., the person in charge of the building being the collector, and responsible to the authorities. Methods hardly less annoying are practised in other European cities. The «octroi,» a tax on produce of any kind brought into a city from the country districts, is prevalent throughout Europe, and adds to the cost of all kinds of food.

**REVENUE CUTTER,** a small armed steam vessel, designed for the prevention of smuggling; so called from the fact that originally the vessel was of the cutter-yacht type. The United States Revenue Cutter Service is a branch of the Treasury Department and its purpose is, principally, to enforce the customs revenue laws. Its immediate supervision resides in a bureau of the department known as the Division of Revenue Cutter Service, which is in charge of a chief and a number of assistants.

**REVENUE CUTTER SERVICE, United States.** The organization of this service in 1790 was the conception of the first Secretary of the Treasury under the Constitution, Alexander Hamilton. In emphasizing its importance Hamilton recommended «giving the officers military or naval rank, which will not only induce fit men to engage, but attach them to their duties with a nicer sense of honor.» The original purpose was to inaugurate a «preventive service,» as against illicit trade by sea, and in that sense to aid the customs service in the collection of the revenue from duties on imposts. The organic act provided for ten small vessels, armed and equipped, and for each a complement of officers and enlisted men, and these formed the nucleus from which has grown the service of to-day. From the beginning the service was placed upon the same plane as to pay and allowances for its officers and enlisted men, with the officers and soldiers of the army.

Various acts of Congress (1 Oct. 1790, 2 March 1793, 6 March 1796, 1 July 1797) provided for additional and larger vessels, increase of crews, armaments and equipments. It is interesting to note that this service was the only semblance of a navy possessed by our government from 1790 to 1797, when on 10 July, in the latter year, the first vessel of the then new navy, the 44-gun frigate *United States*, was launched. In the meantime the duties of the service were such as were required of an armed service, in guarding the coast and commercial interests, and also against piratical incursions. But during those years our relations with France were becoming strained, culminating finally in active hostilities at sea between vessels of the United States and of France. The difficulties with France may be said to have been the first war of the young republic with a foreign power. During its continuance (1798 to 1801) several engagements were fought and many captures were made by our vessels.

The revenue cutter service took an active and brilliant part in co-operation with the navy. Thus, while this service was organized as a preventive service to be operated in the interest of commerce and for the protection of the revenue, it had, in these early years, rapidly developed into an armed and equipped military or naval service, offensive and defensive, and this character was well and continuously maintained.

At the breaking out of hostilities with France provision for an armed force upon the sea, to convoy merchantmen and to defend the coast, became indispensable. To accomplish these purposes the President was authorized (Act 1 July 1797) to increase the complements of the several revenue cutters, and to employ them in defensive operations on the coast. Under authority of previous enactments the service had been provided with a number of vessels which, for that time, were of considerable size and able sea-going qualities. In 1798 two brigs and six schooners were commissioned, aggregating 1,140 tons, carrying 96 guns and 416 men.

When it was determined, in 1798, to extend hostile operations against France, to the waters of the West Indies, four fleets, under Commodores Barry, Truxton, Tingey and Decatur, United States navy, comprising in all some 20 national vessels, were formed to prey upon French commerce and destroy that nation's privateers, the above-named vessels of the revenue cutter service were placed in co-operation with the navy and sailed with the fleets, and in the summer and fall of 1799 did fine service. It was during this war that the frigate *Constellation*, under Commodore Truxton, captured the French frigates *Insurgent*, 40 guns, and *Vengeance*, 44 guns. During the naval operations against France 22 vessels, privateer and other, under the French flag, were captured, and of these 16 were made prizes by the revenue cutters, unaided, while they assisted in the capture of two others.

**The Slave Trade.**— Under the provisions of law inhibiting the slave trade, between the United States and foreign countries, the revenue cutter service, in common with the navy, took an active part in its suppression, and in the course of its work captured many slavers and liberated an aggregate of 487 negroes.

**The War of 1812.**— For the enforcement of the embargo laws of 1807, Congress by the Act of 6 Jan. 1809, and another enactment of the same date, made provision for additions to the fleet of revenue cutters of 42 vessels. Following the proclamation of the President ordering all British armed vessels to leave the ports of the United States, and laying the first embargo in December 1807, to the close of the War of 1812, which ensued, the service bore an honorable and conspicuous part. Numerous and varied duties in the enforcement of the embargo laws up to the date of their repeal, and subsequently the non-intercourse act, fell to the revenue cutter service until the declaration of war, 4 June 1812, when the service entered upon an active career, to capture, burn, sink and destroy the commerce of the enemy in co-operation with the navy. The first prize in that war was the British trading schooner *Patriot,* with a valuable cargo, and was captured by the revenue cutter *Jefferson,* Capt. William Ham, 25 June 1812, just 21 days after the declaration of war. Following this the cutters *Madison* and *Gallatin* made valuable prizes. The British privateer *Dart,* 14 guns, had been for some time cruising and committing depredations on our coast near Newport, R. I. On 4 Oct. 1813, the revenue cutter *Vigilant,* Capt. John Cahoon, having augmented his crew by a draft of some 20 men from the United States frigate *President,* Commodore John Rogers commanding, sailed from Newport in pursuit. Soon after coming up with the enemy he captured the vessel by boarding and conveyed the prize and prisoners to Newport. One of the most notable actions fought upon the water in the War of 1812 took place in York River, near Chesapeake Bay, on the night of 12 June 1813, when the cutter *Surveyor,* commanded by Capt. William Travis, succumbed after a desperate resistance to superior forces from the British man-of-war *Narcissus.*

During this war the revenue cutter service captured 10 merchantmen, three barges, three officers and 60 men; one privateer mounting 14 guns. The cutters *Eagle, Mercury* and *Active* did duty as scouts and on blockade service. The cutters *Commodore Barry, Surveyor* and *Eagle* were captured by the enemy, but only after hard struggles and most gallant defenses.

**Neutrality Laws.**— The enforcement of the neutrality laws, during the European troubles from 1815 to 1823, engaged much of the attention of the service, but this duty has always been a part of the vigilant work of the service, and is no less true of the earlier years than in the operations of later times.

**Nullification, 1832.**— During the attempt to nullify the laws relating to the collection of revenue from imposts, by the State of South Carolina, five vessels of the revenue cutter service were ordered to Charleston Harbor, with instructions "to take possession of any vessel arriving from a foreign port, and defend her against any attempt to dispossess the customs officers of her custody until all the requirements of the law had been complied with." The silent influence exerted by the presence of this fleet was a large factor in the solution of the difficulties which menaced peace.

**Piracy.**— During the early years of the last century, piracy which prevailed along the Gulf Coast of our possessions acquired from France and Spain, was suppressed, chiefly by the revenue cutter service. That service waged relentless war upon the corsairs, pursued them into every bay and bayou, broke up their resorts and rendezvous, attacked and dispersed them whenever found. While engaged in this work the cutters *Louisiana* and *Alabama* were attacked off the south coast of Florida by the pirate *Bravo,* commanded by Jean La Farge, a lieutenant of the notorious Jean Lafitte. The *Bravo* was signally defeated, and carried by boarding in a hand-to-hand struggle. The rendezvous of the pirates on Breton's Island, La., was attacked by the cutters *Alabama,* Captain Cartigan, and *Louisiana,* Captain Loomis, and the resort broken up. This practically put an end to organized piracy on our Gulf Coast, though piratical craft from Mexico, Central America and South America, subsequently made incursions on that coast. The pirate *Bolivia* with its prizes *Antoinette* and *Isabella* were found by the cutter *Louisiana,* Captain Jackson, at the South West Pass of the Mississippi River. Jackson attacked at once, captured the *Bolivia* and liberated the prizes, and carried his prisoners to New Orleans. The *Bolivia* carried three guns and 34 men; the cutter *Louisiana* two guns and 16 men.

**Seminole War, 1836–42.**— During the Florida War for the suppression of Indian troubles in that region, the revenue cutters *Dallas, Washington, Dexter, Jefferson, Jackson, Madison, Campbell* and *Van Buren* rendered valuable and conspicuous service in Florida waters, co-operating principally with the army.

**The Mexican War, 1845–47.**— The revenue cutter service was represented in this war by the following named cutters: Schooners *Forward, Ewing, Van Buren, Wolcott, Woodbury, Morris,* and steamers *McLane, Legare, Spencer, Bibb* and *Polk.* They took an active part principally in co-operation with the armies under Scott and Taylor. Some of these vessels, notably the *Forward* and *McLane,* served in co-operation with the navy, in the fleet commanded by Commodore Conner. In the squadron of Commodore M. C. Perry, at the capture of *Frontera* and *Tabasco,* the *Forward* took a brilliant part.

**Paraguay Expedition.**— In the naval expedition to Paraguay, in 1858, the steam revenue cutter *Harriet Lane,* seven guns, eight officers and 104 men, served in co-operation with the navy, and rendered valuable services.

**Winter Cruising.**— The Act of Congress, approved 22 Dec. 1837, now embodied in section 1536, Revised Statutes, requires that a suitable number of public vessels shall cruise upon the coast in the severe portion of the winter weather to afford aid to distressed navigators. The work outlined in the law, now undertaken by the coast guard and always effectively performed by the revenue cutter service, is energetically maintained. As a result of the work many hundreds of lives and many million dollars' worth of property have been saved. Vessels of commerce are frequently fallen in with at sea, with sails blown away, crews frostbitten and unable to respond to duty; they are taken in tow and to a harbor; others short of provisions and water are supplied, while others again, found stranded, are floated when possible. In short, everything possible is done for the relief and care of the distressed mariner of whatever nationality wherever found, during the hard weather on our storm-driven coast from December to April, and prompt response is always made by the service at the cry of distress at all seasons and all hours.

**Life-Saving Service.**— This, an outgrowth of the revenue cutter service, formed part of the division of revenue cutter service prior to its organization as a separate service under the act approved 18 June 1878. On 28 Jan. 1915, the two services were again fused.

**In the Civil War, 1861–65.**— The service was conspicuous and valuable throughout this period from the attempted relief of Sumter in April 1861 to the close of hostilities in 1865. The *Harriet Lane* co-operated with the navy at the capture of the fortifications at Hatteras Inlet; the *Forward* rendered support and assistance to General Butler at Annapolis, Md.; the *Miami* covered the landing of troops at Lynn Haven Bay for the recapture of Norfolk; the cutter *Naugatuck* took part in the attack on Sewell's Point, led the naval fleet up the James River and participated in the bombardment of Drewry's Bluff, 15 May 1862; the *Nemaha* rendered efficient aid to the army and navy on the South Atlantic Coast, received on board General Sherman at Fort McAllister, Savannah, Georgia, at the end of his «march to the sea,» and conveyed him to the naval fleet below. The *Forward, Brown, Agassiz, Toucy* and *Antietam* rendered important service in the waters of North Carolina, while the *Jackson, Hercules, Reliance, Tiger* and *Allen* performed excellent service in the Chesapeake, co-operating with the naval forces in the gunboat flotilla in those waters.

**In Peace from 1867 to 1898.**— The achievements of the service were numerous and varied during times of peace, and honorable, often heroic in both peace and war. It blazed the way to and through Alaska, and for many years from the date of the acquisition of that territory in 1867, except for the occasional visit of a naval vessel, was the only service to exercise authority or to display the national emblem in the waters of that coast from Sitka to Bering Sea, and the Arctic Ocean to Point Barrow. It is on guard in the waters of Alaska from early in May until late in December of every year, rendering aid to shipping, caring for the shipwrecked, and assisting to their homes the unfortunate and the destitute. Its surgeons yearly prescribed for and as far as possible aid the sick, and hardly a year goes by in which more than a thousand cases are not treated or relieved by the medical officers of our cutters in Alaskan waters. In these waters alone the service has rescued and brought home from the Arctic Circle hundreds of shipwrecked whalers, and others, who, but for the timely aid of the service, must have perished.

**In the Spanish-American War, 1898.**— Hardly had the war commenced when the revenue steamer *McCulloch,* bound for San Francisco, was overhauled at Singapore, by cable, directing her to report at Hongkong to Commodore Dewey, commanding the Asiatic fleet. The ship made a quick run to Hongkong, joined Dewey, and accompanied him in his Manila campaign, performed fine service, and brought to a waiting world the first news wired from Hongkong of the victory of Manila Bay. That ship, the *McCulloch,* remained with Dewey until November following, and incurred the very highest praise on his part.

At the battle of Cardenas, 11 May, the revenue cutter *Hudson,* Lieut. Frank H. Newcomb, R.C.S., commanding, sustained the fight against the gunboats and shore batteries of the enemy, side by side with the naval torpedo-boat *Winslow* and when Ensign Bagley and half the crew of the latter-named vessel had been killed and her commander wounded, rescued from certain destruction the vessel and the balance of the crew, under the furious fire of the enemy's guns.

President McKinley made the work of the *McCulloch* and *Hudson* the subject of a special message to Congress, in terms of high commendation and praise and as a reward of merit in the case of Hodgsdon of the *McCulloch* (there being no higher grade in the revenue cutter service to which he could be promoted) that he be retired from active service on the full pay of his grade and in recognition of the heroic gallantry noted in the letter of the Secretary of the Navy, the bestowal of a gold medal of honor upon Lieutenant Newcomb, of the *Hudson,* and silver medals of honor to each of his officers and bronze medals to each of his crew. It will be noted that the only gold and silver medals bestowed by Congress for services in this war were those for officers of the revenue cutter service. There were in co-operation with the navy during this war, 13 revenue cutters carrying 61 guns, 98 officers and 562 enlisted men. Of these eight cutters (43 guns), 58 officers and 339 men were in Rear-Admiral Sampson's fleet and on the Havana blockade. One cutter, 6 guns, 10 officers and 95 men in Dewey's fleet and 4 cutters, 12 guns, 30 officers and 128 men co-operated with the navy on the Pacific Coast. Three other cutters, with 25 officers and 210 men, were ordered into co-operation, but the war closed before they were equipped or could get to the front. There were in active co-operation with the army and navy together in all 20 cutters, carrying 71 guns, 131 officers and 725 men. The services performed by the vessels of the revenue cutter service in co-operation with the navy during this war were officially acknowledged by the commanders of the fleets with which they served.

On 28 Jan. 1915 the revenue cutter and life-saving services were merged into the coast guard. See COAST GUARD; LIFE SAVING SERVICE, THE UNITED STATES.

**REVERBERATORY FURNACE,** a furnace in which the material is heated without coming into contact with the fuel. Between the fireplace and the bed on which the material to be heated lies a low partition wall, called a firebridge, is placed. The flame passes over this bridge and plays down against the bed, being reflected or reverberated (whence the name) by a flat arch which surmounts the whole.

**REVERE**, rĕ-vēr', **Joseph Warren**, American military officer: b. Boston, Mass., 17 May 1812; d. Hoboken, N. J., 20 April 1880. He entered the navy as midshipman in 1828, attained the rank of lieutenant in 1841, served in the Mexican War, and in 1850 resigned from the navy. At the outbreak of the Civil War he was appointed colonel of volunteers in the army and in 1862 was promoted brigadier-general. He commanded a brigade at Fredericksburg and was engaged at Chancellorsville. For his conduct in the latter battle he was censured by his superior officer, tried by court-martial, and dismissed from the service in 1863. The decision was revoked by President Lincoln and Revere then resigned. He published ‘Keel and Saddle’ (1872).

**REVERE** (French, RIVOIRE), **Paul**, American patriot: b. Boston, Mass., 1 Jan. 1735; d. there, 10 May 1818. He was trained as a gold- and silver-smith and was skilful in the engraving of designs for silver plate. In 1756 he participated in the expedition for the capture of Crown Point, upon his return from which he set up as a goldsmith and also practised copper-plate engraving. Among his prints were a likeness of Samuel Adams, a portrait of King Philip, a view of Castle William and the Boston Massacre. He also engraved the plates for the earliest paper currency of Massachusetts. In 1774 he was one of the grand jurors who refused to serve in consequence of the act of Parliament making Supreme Court justices independent of the legislature as regards salary. In the autumn of that year he became one of the «thirty Northend mechanics,» who patrolled the Boston streets to watch the movements of the British forces. On 14 April 1775 this committee of observation noted preparations in barracks and on board ship on the part of the British. On the evening of the 18th it was seen that troops were marching across the common to the inner bay. Revere forthwith had a preconcerted signal set in a Northend church tower — the honor being claimed for Christ Church and for the church in North Square destroyed by the British — crossed the river, mounted a horse on the Charlestown side and began his famous «midnight ride.» He was none too early, for at 2.30 A.M., 800 British troops were landed at Lechmere Point and marched on Lexington. Revere became the trusted special messenger of the committee of safety and after the evacuation of Boston was made successively major and lieutenant-colonel of a regiment of artillery. He took part in the Penobscot expedition in 1779. After the Revolution he resumed as gold- and silver-smith, built a bell- and cannon-foundry and in 1801 established large copper-rolling works at Canton, Mass. It is said that he was the first in America to smelt copper ore and to refine and roll copper into sheets and bolts. He was conspicuously associated with benevolent enterprises. Longfellow's poem, ‘The Midnight Ride of Paul Revere,’ in which, says Winsor, the author has «paid little attention to exactness of fact,» is well known.

**REVERE**, Mass., city in Suffolk County, on the Atlantic Coast and on the Boston and Maine Railroad, northeast of Boston. The place was settled in 1627 and was first named Rumney Marsh. Until 1738 it was a part of Boston. In 1739 it was incorporated as Chelsea and in 1846 was set off and reincorporated as North Chelsea. In 1871 the name was changed to Revere, in honor of Paul Revere (q.v.). It received its city charter in 1915. It is a popular residential town and summer resort. It has a Massachusetts State Bath House, built and maintained by the State; Revere City Hall, a memorial to Paul Revere, and a Carnegie library. It has a number of churches and good public schools. It has a city government controlled by a mayor and nine councilmen. Pop. (1920) 28,823.

**REVEREND**, a title of respect given to ministers of religion — in the United States to the clergymen of all religious denominations, including the Jewish Church: the titles very reverend, right reverend and most reverend are given to deans and vicars-general, bishops and archbishops, respectively. A like usage prevails in England, but strict churchmen of the Establishment long refused to accord the title reverend to the clergymen of the dissenting churches. When the bishop of Lincoln in 1874 refused to allow this title to be inscribed on the tombstone of a Wesleyan minister, his action was approved by judgments of the Arches Court; but that judgment was reversed on appeal to the Privy Council, when the title was declared to be simply one of courtesy and not confined to clergymen of the Established Church. In Scotland the principals of the universities, if they be clergymen and the moderator of the general assembly for the time being, are styled very reverend.

**REVERIES OF A BACHELOR**, or **A BOOK OF THE HEART**, a collection of meditative papers by Donald Grant Mitchell, originally issued under the pseudonym, «Ik Marvel.» The first ‘Reverie’ was published in the *Southern Literary Messenger* in 1849, and reprinted the following year in *Harper's New Monthly Magazine*. These papers, full of sentiment, enjoyed a wide popularity at the time of their appearance and still find favor with readers.

**REVERSION**, *in biology*, the reappearance in an animal or plant of characteristics not of its parent, but of more remote ancestors. This frequently occurs in varieties of domesticated animals or of cultivated plants, which have been produced by artificial breeding and which suddenly develop traits belonging to the wild stock. The more highly bred and artificial the variety of animal or plant, the more liable is it to show this occasional reversion. That the tendency is strong and persistent appears from the fact that if the variety is not kept pure by careful breeding, as when a flower escapes from cultivation or a race of domestic animals runs wild, it soon begins to resume the characteristics of, or «revert toward,» the wild stock from which it sprang. This reappearance of abnormal characters, as of color, markings, etc., is very likely to occur in the progeny resulting from the crossing of dissimilar races or species, which can be explained only on the supposition that such characters belonged to remote ancestors, perhaps thousands of generations removed. This was illustrated very forcibly by the experiments undertaken at Penycuik, in Wales, by Ewart, in the crossing of zebras with mares, the offspring of which exhibited many peculiarities belonging to neither parent. Consult Darwin, ‘Variation of Animals and Plants Under Domestication’ (London 1888); Ewart, ‘The Penycuik Experiments’ (London 1899); and the authorities cited under HEREDITY.

**REVERSION,** *in law,* the right to property which remains after some particular estate has ceased which has been granted by the owner. In the United States this is virtually the only meaning of the term in general usage. In England, where the purchase and holding of annuities is common, a reversion means the present right to a payment to be made at some future time, conditional upon certain contingencies, as in the case of an insurance failing to be paid on the attainment of a certain age, or on the death of the assured. The value of a reversion is easily ascertained when the date of its emergence is fixed, and thus a person who has a right to receive a certain sum of money at a given time is enabled to sell this right for its just value. See PROPERTY.

*In heredity,* reversion is the reappearance in offspring of ancestral feature or type. Atavism is nearly synonymous, but properly more restricted, referring to the return of characters observed in less remote ancestors, of the human race especially. Reversion is sometimes seen in cultivated plants, exhibiting features of the wild plant. Domestic animals do not always return to the feral form and color, when they run wild, but in many instances or in some degree they do. Pigs have resumed stripes and other characteristics of the wild boar. Black is supposed to be the original color of sheep to which some in almost every flock return, despite most careful exclusion for many generations. The crossing of breeds sometimes reproduces at once the original type, as in the case of pigeons and white and black fowls; the former was followed by offspring like the wild blue rock pigeon; the latter became red like the original jungle-cock of India. In plants there is often a partial morphological reversion, as when stamens are reconverted into petals, or petals into leaves. See HYBRIDITY; MENDEL’S LAW, and consult Darwin, C., ‘Variation of Animals and Plants under Domestication’ (2 vols., New York 1900), and Ewart, J. C., ‘The Penicuik Experiments’ (London, 1899).

**REVIEWS.** See PERIODICAL LITERATURE.

**RÉVILLE,** rā-vēl, **Albert,** French Protestant theologian: b. Dieppe, France, 4 Nov. 1826; d. 1906. He was educated at Geneva and Strassburg, and was pastor of the Walloon Church at Rotterdam, 1851–72. He then removed to Dieppe, where he spent his time in philosophical studies till called in 1880 to the chair of the history of religions in the Collège de France. He was one of the most radical French Protestants of his time, and among his numerous books are ‘Comparative History of Philosophy and Religion’ (1859); ‘Redemption’ (1860); ‘Essais de Critique religieuse’ (1860); ‘Theodore Parker, sa Vie et ses Œuvres’ (1865); ‘History of the Dogma of the Divinity of Jesus Christ’ (1869); ‘Introduction to the History of Religions’ (1881); ‘Histoire des Religions’ (1883–89).

**REVISED STATUTES OF THE UNITED STATES,** a compilation of all the acts of the Congress of the United States; it was first approved by Congress 22 June 1874, thus becoming law; at that time the compilation included all the laws enacted by Congress down to 1 Dec. 1873. The second edition of the Revised Statutes comprised the first edition as amended by the 43d and 44th Congresses; supplements have since been approved and published containing later acts of Congress. The act approving the Revised Statutes makes that compilation the authentic and authoritative expression of the laws, without reference to the original acts, but the originals may be quoted to show the true intent of the lawmakers if there is any ambiguity in the compilation.

**REVISED VERSION,** a revision of the authorized version (or King James’ version) of the Bible. The project of the revision originated in the Convocation of Canterbury, 1870, when two companies of biblical scholars of the Established Church, one to revise the Old Testament, the other the New, were appointed, with power «to invite the co-operation of any eminent for scholarship, to whatever nation or religious body they may belong.» Afterward, under a resolution of the Convocation, two companies of American biblical scholars were formed, to act with the English companies. The work of revision, which was commenced 30 June 1870, was completed 20 June 1884; the New Testament was published in England and the United States in May 1881, and the Old Testament in May 1885. Many readings and renderings proposed by the American revisers were not approved by the English companies either for adoption into the text or the margin, but were ordered to be recorded at the end of the New Testament or the Old, respectively. But an edition of the whole Bible having the renderings preferred by the American companies and many other renderings since proposed by American scholars has been published in the United States and is known as the American Revision. See BIBLE.

**REVIVAL OF LETTERS,** a term used to designate the revival of literature after the apparent death blow which it received when the barbarous nations of the North destroyed the Roman empire. It commenced about the beginning of the 11th century, and became more potent in the 14th, 15th and subsequent centuries.

**REVIVAL OF RELIGION,** a season of religious awakening out of spiritual torpor or indifference; usually brought about by the fervid exhortations of men deeply impressed with the feeling that the churches, the pastors and the people have been slumbering while Satan has been gaining possession of the kingdom of Christ on earth. The term, revival of religion, is a modern one, but the thing it signifies is as old as Christianity, as old as Iraelitism or as religion itself. The mission of every one of the Hebrew prophets was for the revival of religion; in the Christian Church, revivals, though not called by that name, occurred at intervals from apostolic times; and every sincere and enthusiastic reformer — Saint Peter Damiani, Saint Francis of Assisi, Saint Dominic, in the Middle Ages; the Jesuits, the Redemptorists and other missionary orders; these were in their time revivalists in fact, though not in name. The Reformation is regarded by Protestants as a great awakening of the Christian consciousness and the wellspring of all the efforts that have since been made for the renovation of the spiritual life in the Protestant churches. In England, at the beginning of the 17th century the religion of the Established Church had degenerated into a cold but decent formalism, but a revival of spiritual interest in the common people was brought about through the instrumentality of the Puritans. After the restoration of the monarchy and of the State church there was a period of spiritual sloth and apathy, infidelity and immorality till in the 18th century Great Britain was aroused by the fervid preaching of the Wesleys, Whitefield, Rowland Hill, Romaine, Venn, Newton, Cecil, Fletcher and others, earnest men who were raised up and qualified by the divine spirit for the work which lay before them. (See METHODIST CHURCHES OF THE WORLD). In the colony of Massachusetts Jonathan Edwards carried on notable revivals at Northampton in 1734. Shortly afterward Gilbert Tennant aroused great religious interest in New Jersey. The impulse spread through the colonies, and has been called the Great Awakening; it seems to have arisen independently of the movement in the parent country; but it was greatly quickened by the missionary labors of John Wesley and George Whitefield during their visits to the colonies. Its influence was very powerful during the years 1740, 1741 and 1742, and its quickening results were felt long afterward, and inspired the multiplication of churches, seminaries and colleges. About the same time there was a remarkable revival of religion in various parts of Scotland, especially at Cambuslang and Kilsyth; and out of a similar awakening in Wales arose the Welsh Calvinistic Methodist Church. In 1839 Kilsyth was again the focus of a great revival of religion, which extended to Dundee, Perth, Blairgowrie, Ancrum, Jedburgh, Kelso, and in the north of Scotland to Ross-shire and Sutherlandshire. In the first half of the 19th century there were many revivals in the United States, notable among which were those under Charles G. Finney (q.v.), who also visited Great Britain and preached to vast crowds in London and other cities; a notable feature of the great revival commenced in 1830 was the camp meetings (q.v.), assemblies of great numbers of people, held in the open air and addressed by relays of evangelists from morning till night. In 1858 there was a great revival of religion in the United States, which subsequently extended to the British isles and even to the continent of Europe. Its principal centres at first were New York and Philadelphia, whence it spread throughout the States, producing for a time a sort of federation of the evangelical churches for the promotion of the work of spiritual conversion. In nearly every city in the land meetings for prayer were held daily, often in business hours, in churches, in counting houses, in theatres and other places of public resort; in the one State of New York more than 2,000 cities, towns or villages had an active part in this revival; throughout the country the interest in the movement was universal; daily reports of the deep religious feeling of the people were received at the principal centres and published in the newspapers. In New York every evangelical church received large accessions to its membership, and a like report was made concerning Boston, Baltimore, Washington, Chicago, Cincinnati, Pittsburgh and other cities. For nearly two years the meetings for prayer and the labors of the evangelists continued almost unflagging, and for many years noonhour prayer-meetings continued to be held in the business centres of many of the cities. In the summer of 1859 the movement extended to the north of Ireland, where it was not less fruitful of spiritual good than in America; the people flocked to the services in the open-air meetings or assembled in social gatherings for devotional exercises; there was a noticeable diminution of vice and immorality, especially of drunkenness; and judges and magistrates cordially recognized the reality and power of the spiritual work. From Ireland the revival spread to Scotland, and in Glasgow, Edinburgh, Aberdeen, Perth, Dundee, and the other considerable towns, the religious denominations joined in active exertions to bring the neglected poor within the range of evangelistic and educational agencies. It extended to Wales also, where in one year the increase in the membership of the Calvinistic Methodist body alone was 33,724 souls; the gain to the independent denomination was 30,000, to the Established Church 20,000 and to the Wesleyan body 10,000. In more recent times the great revival in Wales of 1904–06 was conspicuous for its great wave of moral regeneration in certain districts. In the West and Southern United States and rural districts of the East the revival often took the form of the camp meeting (q.v.), and these open air gatherings continue to be made an instrument of evangelism and conversion by the Methodist Church. Out of the camp meeting sprang the Chautauqua Assembly (q.v.), an institution both religious and educational Especially notable was the revival initiated in Chicago by Dwight Lyman Moody (q.v.) and conducted by him in conjunction with Ira D. Sankey. These two evangelists — a preacher and a singer of the gospel — visited Great Britain in 1873, and for two years in the principal cities of England, Scotland and Ireland their meetings were attended by multitudes from all ranks of society, and their labors zealously seconded by ministers of all the evangelical churches; thousands of persons professed conversion, and there was a manifest religious awakening. The two evangelists on their return home engaged in revival work of the same kind in the American cities; and they subsequently made two visits to Great Britain, namely, 1883–84 and 1891–92. The Salvation Army (q.v.) and the Volunteers of America (q.v.) are agencies designed to promote a continuous revival of religion, especially among the poor and neglected classes.

Among modern American revivalists and professional evangelists are «Gypsy» Smith, J. Wilbur Chapman, «Sam» Jones, R. A. Torrey, and most prominent of all «Billy» Sunday, an ex-baseball player who, though lacking in the elegancies of speech, possesses an energy of statement, a seemingly boundless enthusiasm and an ability for drawing and holding an audience that is phenomenal. He is the most conspicuously successful revivalist since Moody.

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**REVOCATION OF THE EDICT OF NANTES.** See EDICT OF NANTES.

**REVOLUTION,** a term commonly used to designate a fundamental change in government, or in the political constitution of a country, effected or sought to be effected by violence and force of arms of a considerable number of individuals, and mainly brought about by internal causes; a revolt against the constituted authority more or less successfully and completely accomplished. In the United States the term Revolution is applied specifically to the American War for Independence, which began in 1775 with the irregular running fight popularly known as the battle of Lexington, and practically ended with the surrender of Lord Cornwallis, at Yorktown, Va., to the combined forces of the French and Americans, 19 Oct. 1781. By this war the colonies succeeded in casting off the English authority and in erecting the government of the United States. The English revolution was that revolution in England by which James II was driven from the throne in 1688. The Central American states and Mexico have been seriously afflicted for years with revolutions. See MEXICO; CENTRAL AMERICA; also POLAND; REBELLION; UNITED STATES — AMERICAN REVOLUTION.

The French Revolution began in 1789. (See FRANCE). Others were: Sweden, 1772; Holland, 1795; Netherlands, 1830; Spain, 1868 and 1874; Brazil, 1889; Chile, 1891; Cuba, 1891–98; Norway, 1905; Turkey, 1908; Mexico, 1910; China, 1912.

**REVOLUTION.** (1) *In astronomy,* the motion of a planet around the sun or of a satellite around a planet. The point to which it returns is called annual, anomalistic, nodical, sidereal or tropical, according as it has a relation to the year, the anomaly, the nodes, the stars or the tropics. (2) *In geometry,* when one line moves about a straight line, called the axis, in such a manner that every point of the moving line generates a circumference of a circle, whose plane is perpendicular to the axis, that motion is called revolution, and the surface is called the surface of revolution. Every plane through the axis is called a meridian plane, and the section which this plane cuts from the surface is called a meridian curve. Every surface of revolution can be generated by revolving one of its meridian curves about the axis. The revolution of an ellipse round its axis generates an ellipsoid; the revolution of a semi-circle round the diameter generates a sphere; such solids are called solids of revolution. (3) *In mechanics,* the motion of a rotating body around a centre, as that of a small gear-wheel traveling around a large gear-wheel — distinguished from rotation.

**REVOLUTIONARY CALENDAR,** a calendar adopted during the French Reign of Terror. It was decreed on 24 Nov. 1793, to commence from the foundation of the French republic, 22 Sept. 1792. The 12 months were Vendémiaire, Brumaire, Frimaire, Nivose, Pluviose, Ventose, Germinal, Floréal, Prairial, Messidor, Fervidor or Thermidor, and Fructidor. The first three constituted autumn, the second three winter, the third spring and the fourth three summer. Napoleon I restored the old system 31 Dec. 1805.

**REVOLUTIONARY TRIBUNAL.** A court of extraordinary criminal jurisdiction established by the French Convention, 10 March 1793, for the purpose of trying those accused of plotting «against the liberty, equality, unity and indivisibility of the Republic, the internal and external safety of the state, or the sovereignty of the people.» It received the name Revolutionary Tribunal in October 1793. The court was to consist of a jury and a public prosecutor with two assistants, all named by the Convention, and from its decision there was no appeal. The number of judges rose as high as 80 toward the end of the tribunal's existence. Intended as a means of combating treason at home, the Revolutionary Tribunal speedily became an instrument in the hands of the Committee of Public Safety, whose will it executed under the guise of judicial form. Without any definite procedure, with no legal defenders allowed to the accused and with its acceptance of the vaguest rumors and charges as evidence, the tribunal offered but a mockery of justice and citation before it almost invariably meant death. The reading of the act of accusations, the trial and the execution of the sentence generally occurred on the same day. The tribunal sent 1,220 victims to the guillotine from its inception till June 1794, when Robespierre (q.v.) caused the infamous law to be enacted accelerating its procedure; from that date to the fall of Robespierre, a period of about 50 days, it condemned 1,376 persons, Robespierre and his followers being among the lot. The tribunal soon after ceased its functions and was formally suppressed 31 May 1795. Its sanguinary work must be regarded as justified to a large extent by its success in saving the country from sedition at home at a time of great national danger. It was but one feature of the organized Terror which saved France from foreign conquest. Consult Wallon, ‹Histoire du Tribunal Révolutionnaire de Paris› (1880–82).

**REVOLUTIONARY WAR.** See UNITED STATES — AMERICAN REVOLUTION.

**REWA,** rā'wä, India, (1) the capital of a native state of the same name, 131 miles southwest of Allahabad, and connected by a branch line with Sutna on the East India Railway. It is enclosed by three wall circuits or ramparts, the outer one massive and flanked by round towers. Its chief buildings and institutions are the fortified palace of the maharajah, a high school, hospitals and a model jail. Pop. 24,000. (2) The native state in the Central India Agency and in the subagency of Baghelkhand (q.v.), has an area of 12,676 square miles. It is chiefly an elevated tableland, but also comprises portions of the country on both sides of the Kaimor Hills, watered by the Son, a tributary to the Ganges, and flowing northeast. The surface is in part covered with jungle, but on the whole highly cultivated; the condition of the peasantry is, however, much depressed. The ruins of many temples are scattered over the country. The revenue of the maharajah amounts to about $1,250,000 annually; the armed force consists usually of 4,000 men, though from 10,000 to 12,000 might be mustered. Pop. about 1,700,000.

**REWA KANTHA,** kän'tŭ or -tạ, India, a political agency under the government of Bombay, containing 61 small states, of which five are tributary to the British government, and most of the remainder to Baroda. The territory included, covering an area of 4,980 square miles, with a pop. of about 478,889, lies mainly along the south bank of the lower Nerbudda with patches north of it, and on the western borders of Broach, Baroda and Ahmadabad.

**REWARD,** in a legal sense, some encouragement which the law holds out for exertions in bringing certain classes of criminals to justice. The courts may order the sheriff of the county, in which certain offenses have been committed, to pay to persons who have been active in securing the apprehension of offenders charged with murder or with feloniously shooting, cutting, stabbing, wounding or poisoning, or with rape, burglary, housebreaking, robbery, arson or cattle-stealing, or with being accessory before the fact to any of such offenses, or to receiving any stolen property, a reasonable sum to compensate them for expense, exertion and loss of time. By another statute it is a felony, punishable by penal servitude to the extent of seven years, to corruptly take any reward for helping a person to property stolen or embezzled, unless all due diligence to bring the offenders to trial has been used. States, cities, municipalities, corporations, individuals, etc., may offer rewards for information leading to the detection and punishment of any sort of crime, and this is done not infrequently to induce some one having knowledge of a crime to disclose it, receiving protection as regards any complicity of his own. In Great Britain an advertisement offering a reward for the return of stolen or lost property, using words purporting that no questions will be asked or inquiry made after the person producing the property, renders the advertiser, printer and publisher liable to forfeit $250; but in the United States such advertisements are common. Some courts have held that a reward may be withdrawal by advertisement; also that it lapses after a reasonable time.

**REWBELL,** rĕ-bĕl, **Jean François,** French statesman: b. Colmar, 8 Oct. 1747; d. there, 23 Nov. 1807. He was a prominent advocate of Colmar, and was elected to the States-General of 1789, where he advocated the principles of the Revolution. He was a member of the Constituent Assembly, where his boldness and legal knowledge made him president in 1791. As a member of the Convention, in 1792 he was outspoken in urging the condemnation of Louis XVI; but his absence on a mission to the army at Mentz saved him from being numbered among the regicides. He helped suppress the Jacobin Club in 1794, figured as member of the committees of public safety and of general security; and on the adoption of the Constitution in 1795 he became one of the five members of the Directory and took in charge the departments of Finance, Justice and Foreign Affairs. In 1796 the Directory elected him its president. He succeeded in defending himself from conviction on charges of peculation, but retired from public life after the *coup d'état* of the 18th Brumaire (9 Nov. 1799) and carried with him a large fortune. Consult Sciout, ‹Le Directoire› (1895–97).

**REXFORD, Eben Eugene,** American writer: b. Johnsburg, N. Y., 16 July 1848; d. 18 Oct. 1916. He was educated at Lawrence University, Appleton, Wis., and began to write for the press at 14. He published ‹Brother and Lover,› verse (1886); ‹Grandmother's Garden,› verse (1887); ‹John Fielding and His Enemy› (1888); ‹The Swamp Secret› (1897); ‹Flowers: How to Grow Them› (1898); ‹Into the Light› (1899), etc., and achieved popular fame by his well-known songs, ‹Silver Threads Among the Gold› and ‹Only a Pansy Blossom.›

**REYES, Rafael,** Colombian statesman: b. Santa Rosa, Boyoca, 1852; d. Bogotá, 19 Feb. 1921. He served as Minister of the Interior under President Núñez, was Minister to France and Switzerland and delegate to the second Pan-American Conference in Mexico. In 1904 he was elected President of Colombia. He greatly improved the internal affairs of the republic. He resigned in 1910. Beside the public service rendered by him when he traveled during several years in unknown parts of the Amazon Basin, the facts in his career which deserve special notice are the following: He was commander-in-chief of the Colombian army; was sent to Washington, after Colombia had lost Panamá, to «save whatever he could from the wreck»; and in this patriotic effort he was certainly not altogether unsuccessful, since he gained courage to advocate on his return to Bogotá the policy indicated in the report which he submitted to his government. He advocated, sensibly, courageously and magnanimously, a frank acknowledgment by his people of their own blundering which had contributed to the disaster; and he continued to show his people how the natural resources of the vast territory still remaining in their possession could be developed by attracting foreign capital. He succeeded. The very great imperfectly defined powers of the Presidency were entrusted to him, despite the old ultra Conservatives' hostility to foreign enterprise, and despite the suicidal scheme of the Liberals for permitting Colombia to be absorbed by Venezuela and Ecuador. His success saved Colombia from a future of isolation and stagnation, on the one hand, or, on the other hand, nearly complete loss of identity. President Amador of Panamá and President Reyes exchanged congratulatory messages in August, and the American Minister was received at Bogotá in December 1904. Dr. Reyes is the author of ‘Misión del Rafael Reyes’ (1908); ‘Pro Colombia, Pro Ibero-América’ (1912); ‘The Two Americas’ (1914).

**REYKJAVIK**, rīk'yä"vīk. See REIKIAVIK.

**REYMONT, Wladyslaw Stanislaw**, Polish novelist and poet: b. 6 May 1863. The son of poor parents, he received but little education and, after trying his hand in various employments — on the railway, on a farm, in a store and on the stage, he began his literary career in 1894. Though practically unknown to the English-speaking world, his novels, of which he has written over 20 volumes, have found their way into Russian, French, German, Swedish and Spanish. His first story of ‘Death’ (1894); his first novel ‘The Comedienne,’ appeared in 1896. These were followed by ‘Fermention’ (2 vols.); ‘The Promised Land’ (2 vols.); ‘The Peasants’ (4 vols.); ‘The Vampire’; ‘The Dreamer’ and a trilogy portraying the partition of Poland and the insurrection led by Kosciuszko in 1794. W. Reymont visited the United States in 1919.

**REYNARD** (rā'nėrd) **THE FOX.** The beast-epic, ‘Reynard the Fox,’ the property of the Frankish race of the Netherlands, northern France and western Germany, is perhaps their most original contribution to mediæval literature. To be sure, there is scarcely a people without its animal fables, which in the case of celebrated stories like some of Æsop's go back to remote antiquity, but none has developed a consistent epic such as the Middle-Franconian, Reinaert de Vos. A short poem in Latin composed at the court of Karl the Great in the 8th century by Paulus Diaconus, retells the Æsopian fable of the sick lion, who on the advice of the fox is cured by being wrapped in a fresh wolf's hide. The same story is found in the ‘Ecbasis captivi,’ or ‘The Escape of the Calf,’ in which a Lorraine monk from Saint Evre at Toul relates the story of his escape from the cloister, under the cloak of an animal story, about 940. Other elements from Æsop, Phædrus, the Physiologus and folk-stories were gradually added to the kernel, including human names for the animals, and the Flemish Magister Nivardus of Ghent added 11 other humorous animal stories, including the pilgrimage of Bertiliana, the Goat, with satirical attacks on the vices of the clergy, in a Latin poem of over 6,000 verses, the ‘Isengrimus,’ between 1146–48. Bishop Gaudri of Laon had called his enemy Isengrimus as early as 1112, on the testimony of Petrus Alfonsus in his ‘Disciplina clericalis.’

The beasts apparently received their Teutonic names in Flanders, so Reynard, from a root ragin + hard = strong in counsel; Isengrim, either iron helm, or iron fury; Tibeert, the cat, from Theudebert, a Frankish king; Bruun = brown, the bear. Others like the Leopard Feirepeel, from varium pellem, spotted hide, are French.

**French.**— From this time on the gleemen or traveling entertainers take up the subject and include the court and all ranks of people in their satire, with the result that poets, good and bad, develop a never ending Roman de Renart in French, which is artistically arranged by an unknown editor in some 27 «branches» of more than 40,000 lines, including repetitions and variations. Ernest Martin thinks that perhaps nine of these «branches» were collected by 1180, that a few years later, perhaps at the beginning of the 13th century Pierre de Saint Cloud added «branche» 16 to complete the poem, thus rekindling a waning interest to which was due among others «branche» 20, completed around about 1210 and the foundation of the Flemish epic. Other «branches» were added in the 13th century by the editors from whose labors resulted two broad classes of manuscripts, numbering 15 in all. A lost compilation of 16 «branches» was adapted about 1180 by the German Heinrich der Glichezare. Later continuations of the 13th and 14th centuries were ‘Le couronnement Renart,’ ‘Renart le nouveau’ and ‘Renart le conterfait.’ cf. Rothe, M.A., ‘Les Romans du Renard’ (Paris 1845).

Of the personality of the poets we know nothing. We can only judge from their dialects, from the use of Flemish words, from place names, and scattered historical allusions that they came from either the Flemish and German border or the Isle de France. The older the composition the greater its merit. The later branches became more and more anthropomorphic, less «beastly,» and degenerated into fastidious allegory, the didactic purpose of which became fatally tiresome, and the poem gradually sank into oblivion.

Originally based on the friendship of wolf and fox, this relation changed to hostility and resulted in a series of duels between fox and wolf or the latter's retainers and champions, in which the cunning of the fox invariably worsts the heavier ferocity of his adversary. An especial favorite was the ‘Judgment of Reynard,’ with which Martin's edition begins. Hens, titmice, kites, crows, hares, Tibert the cat, Patous the bear, the ram, the heron, all suffer or are killed. Reynard even becomes emperor, violates the female wolf and seduces the queen, who is at all times his friend, cures King Nobel, the lion, at the expense of the wolf. Finally he dies, or at least is supposed to die, receives a grand funeral (of which there was formerly a sculpture in the cathedral of Strassburg, representing Reynard on a stretcher carried by the other animals), and goes to the animals «paradouse,» «two leagues beyond paradise.» To compliment Boniface VIII, Philip the Fair had the subject matter of this procession played in the streets of Paris about 1303.

*Text:* Méon, M. D. M. (4 vols. with supplement. Frontispiece by Desenne. In Newberry Library, Chicago; Paris 1826); Ernest Martin (Strasbourg et Paris 1887). (The best; Branche I = Méon's Branche XX). *Criticism:* Sudre, L., ‘Les sources du Roman de Renart’ (Paris 1892); also in *Petit de Julleville's* ‘Histoire de la langue et de la littérature française,’ (II Paris 1896); Martin, Ernest, in *Zeitschrift für germanische und romanische Philologie*, 1894; Paris, Gaston, ‘Le Roman de Renard’ (*Journal des Savants*, Paris 1895); Potvin, ‘Roman du Renard’ (Paris 1891). *Translation:* Potvin, ‘Roman du Renard mis en vers’ (Paris-Bruxelles 1861).

**Middle High German.**— Only a few fragments of the Reinhart Fuchs of Heinrich der Glichezare (the Satirist) have come down to us, but a 13th century redaction was edited by J. Grimm in 1834. This poem represents Reinhart in the beginning as the dupe of weaker animals, later as victimizing the wolf in various pranks, working up to the illness of the king, to the trial of Reinhart, to his curing of the king at the expense of his opponents and his final poisoning of his benefactor.

The author seems to have been an errant minstrel or gleeman of whom nothing is known. His style is terse, dry and satirical, with proverbs and local allusions, and German names for animals. He seems to have used a French compilation, containing a portion of the extant Renart but with four episodes of which the French originals have not yet been found.

*Text:* ‹Reinhart Fuchs› (Reissenberger, Halle 1886).

**Flemish.**— Between 1250 and 1270 an unknown poet wrote the 3,476 lines called «van den vos Reinaerde» (of Reynard the Fox). He may have been a «clerk,» Willem, perhaps from Hulsterlo in East Flanders, or possibly an unknown Arnout from Brügge or thereabouts. From the 1st (Martin) branche of the French Roman he derives his poem with logical consistency and epic purpose. It opens with the court of King Nobel, the lion, to whom complaints against the thief and murderer Reinhart are preferred, and bear and later cat are sent to summon the culprit, who gets both into terrible trouble. On the advice of the badger, his «nephew,» he submits, goes to court, defends himself and offers to go on a pilgrimage to Rome. Acquitted by the king he breaks all promises, commits further depredations and is outlawed. It is told naïvely, humorously and well. Only a portion of the names are Flemish, the rest French.

Nearly a century later another unknown, possibly from Brügge, rewrote «Willem's» work, and added some 3,318 lines with copious borrowings from the Roman de Renart, the Flemish adaptation of Marie de France's ‹Isopet,› and various Bestiaries. Its satirical and obviously didactic purpose made it a great favorite for several centuries, as is witnessed by the chap books of Gouda, 1479, Delft, 1485, the Caxton English one of 1481, and the rimed and modernized Antwerp work of 1487, of which last only fragments are preserved because the Duke of Alba and the University of Louvain caused all copies to be destroyed in the year 1570. It was accompanied by didactic glosses and preceded by a preface from the pen of an unknown Hinrek van Alckmer, who was long wrongly considered the author of the Low German ‹Reinke de Vos,› which contains a translation, or more likely an adaptation, of the preface to an Antwerp print of 1564.

*Text:* ‹Reinaert› (Ernest Martin, Paderborn 1874); ‹Reinaert› (F. Buitenrust Hettema en J. W. Muller, Zwolle 1903); ‹Reinaert› (van Helten, Groningen 1891). *Edition* (MS.): Hermann Degering (Münster 1910).

**Low German.**— The first version appeared at Lübeck in 1498 with the so-called Catholic «glosses,» followed by the Rostock edition of 1539 with polemical Protestant «glosses,» from which resulted 14 Low German, 2 high German, 7 Latin, 3 Danish, 1 Swedish translation, down to Gottsched's reprint and prose translation of 1752, which is the beginning of modern «Reinhart» scholarship and the main basis of Goethe's ‹Reinecke Fuchs.›

Reinke (ke is a diminutive) Vos is the principal literary monument of Middle Low German literature, but it has added little to the Flemish original. It has perhaps improved it by slightly amplifying certain portions, while condensing others, by eliminating some of the sermonizing so that a certain refreshing naïveté distinguishes it at least from Reinaert II, and its influence in Germany is deeper and broader than elsewhere. The 16th century engravings of Virgil Solis and Jost Ammann also contributed to this popularity.

*Text:* ‹Reinke de Vos› (Friedrich Prien, Halle 1887). *Criticism:* Th. Carlyle, ‹German Literature of the 14th and 15th Centuries› (*Foreign Quarterly Review,* 1831).

**High German.**— Gottsched's translation in 1752 of the Lübeck version of 1498, illustrated with Everdingen's fine engravings, was read in extract by Goethe to Duchess Amalie in 1782, and the acquisition of «this profane bible» in 1783 «makes him happy as a child,» but it was his disgust at the failure of the campaign to rescue Louis XVI in 1793 that caused him to write: «But I endeavored to rescue myself from this hideous misfortune by declaring the whole world infamous . . . it was now (in ‹Reinke Vos›) really amusing to see court and ruler intrigues mirrored. For even if the human race appeared quite natural in its undisguised bestiality, things went off amusingly, if not perfectly.» Goethe's work adds practically nothing to the original except his own political confession in the eighth canto. He divided the poem into 12 cantos and adopted the dactylic hexameter in place of the rime verses of four accents of the ‹Reinke.› Goethe's version gave rise to Wm. Kaulbach's inimitable drawings, the delight of older generations.

*Text:* Gottsched, J. C., ‹Reineke Fuchs› (1752, and Halle 1886); Goethe's ‹Werke› (1794, Vol. II); ‹Reineke Fuchs› (Munich 1847; with Kaulbach's woodcuts; tr. into English by T. J. Arnold); Simrock, K. J., ‹Reineke Fuchs› (Frankfurt 1845, original metre); Soltau, ‹Reineke Fuchs› (Berlin 1803, original metre).

**English.**—‹Vox and the Wolf› (13th century), Chaucer's ‹Nonne Preestes Tale,› and Caxton's translation (1481) of the Gouda reprint of 1479, popularized the tale in England. In 1844 W. J. Thoms edited the last for the Percy Society. In 1895 appeared Joseph Jacobs' ‹The Most Delectable History of Reynard the Fox,› with a valuable introduction. In 1852, E. W. Holloway published in Leipzig ‹Reynard the Fox,› translated from the German of Simrock mainly, illustrated by the fine woodcuts of H. Leutermann. T. J. Arnold translated from Goethe with illustrations by J. Wolf (1855); same with illustrations by W. von Kaulbach (1860).

CARL E. EGGERT,
*Sometime Assistant Professor of German, University of Michigan.*

**REYNOLDS,** rĕn'oldz, **Edwin,** American engineer: b. Mansfield, Conn., 23 March 1831; d. 1909. He was apprenticed to a machinist in

1847 and in 1857–61 he was superintendent for Stedman and Company at Aurora, Ind. He was superintendent of the Corliss Steam Engine Company, Providence, R. I., in 1871–77, and was afterward connected with the Edward P. Allis Company, Milwaukee, Wis. He invented the Reynolds-Corliss engine, introduced the first triple expansion pumping engine, and the cross compound hoisting engines for mining work.

**REYNOLDS, James Emerson,** Irish chemist: b. Booterstown, County Dublin, 1844. He took the degrees M.D. and Sc.D. at the University of Dublin, and in 1867 was appointed keeper of minerals at the National Museum at Dublin. He was professor of analytical chemistry at the Royal Dublin Society in 1870, and in 1873 became professor of chemistry at the Royal College of Surgeons, Ireland. In 1873–1903 he was professor of chemistry and chemical philosophy at Dublin University. He was president of the Society of British Chemical Industry in 1891; of the Chemical Society, London, in 1902–03, and vice-president of the Royal Society in 1902. He discovered many chemical substances, including thiocarbamide and its allies; a new class of colloids, and several groups of the element silicon, which he described in reports in the ‹Transactions› of the Chemical Society and the Royal Society. Author of ‹Lectures on Experimental Chemistry› (1874); ‹General Experimental Chemistry› (1880).

**REYNOLDS, Joseph Jones,** American military officer: b. Flemingsburg, Ky., 4 Jan. 1822; d. Washington, D. C., 25 Feb. 1899. He was graduated from West Point in 1843 and after service at Fort Monroe and in Texas was, in 1846, assigned to the Third artillery and was on frontier duty at Fort Washita, I. T., in 1855–56. He then resigned to become professor of mechanics and engineering at Washington University, Saint Louis. At the beginning of the Civil War he entered the Federal army as colonel of the 10th Indiana Volunteers, soon becoming major-general of volunteers. He was engaged in the battles of Chickamauga and Chattanooga; later was in command of the defenses of New Orleans from 6 January to 16 June 1864; and of the Mississippi River from its mouth to Memphis, Tenn., from October to December 1864. In 1866 he was mustered out of the volunteer service and promoted colonel in the regular army. He was brevetted brigadier-general in 1867, retiring from active service in June 1877.

**REYNOLDS, Sir Joshua,** English portrait painter: b. Plymouth, Devonshire, 16 July 1723; d. London, 23 Feb. 1792. He was the son of Rev. Samuel Reynolds, master of the grammar school at Plympton Saint Mary, Plymouth, who intended him for the medical profession; but Reynolds declared himself for art and went to London in 1741 and studied under Thomas Hudson. This painter was at the head of his profession at a time when there were no very shining lights and from him Reynolds acquired a correctness of drawing and a certain reflection of the style of Van Dyck that gave way subsequently, in great measure, to other influences. He returned to Devonshire after two years and painted portraits for small prices; went again to London in 1745 and established himself as a painter, but the death of his father the following year recalled him to Plymouth. In 1749 he accompanied young Commodore Keppel, then sent on a mission to the Barbary states, to the Mediterranean and spent more than three years in Italy, mainly at Rome with visits to Florence, Bologna, Parma, Venice and a short stay at Paris on his return to London. In Italy, he studied the Italian masters, especially in respect to their handling of light and shade. He learned from the Venetians much of their mastery of color, so that when he settled again in London in 1753 his work showed the influence of Correggio primarily with reminiscences of Tintoretto, Veronese and Titian. In that year he painted a portrait of Commodore Keppel that lifted him at once into fame. This picture, now in the Grosvenor Gallery, is almost a monochrome in gray, with a few faint suggestions of color; but is remarkable for its effects of light and for individuality of portraiture. So popular did the young painter become that in 1755 120 persons sat to him for their portraits. His work, which is of such considerable extent, does not display a uniform excellence, since to produce it all he had to call in the assistance of journeymen. In 1768 he was made president of the Royal Academy upon its establishment; and the next year he delivered his first discourse to the students. His social success was commensurate with his fame as an artist; George III knighted him and appointed him court painter in succession to Allan Ramsay. He lived on terms of intimacy with Dr. Johnson, Goldsmith, Burke, Gibbon, Garrick and was the founder of the Literary Club in 1764 where these distinguished men assembled. His body lay in state in the Royal Academy and he was buried in Saint Paul's Cathedral.

The mention of his portraits would include all the names famous in the upper world of society and the arts in his day, and there is no higher source for learning of the beauty of English women, the character of English men and the fashions of taste of the later 18th century. He was graceful in arrangement of figures and accessories, was able in his portraits of men and women to differentiate a masculine vigor and a feminine charm, and in his mastery of color achieved a position, according to Ruskin, as «one of the seven great colorists» of the world. Posterity cannot fully appreciate his power in the latter direction, as he often used impermanent mediums and resorted to a thick impasto, which has cracked with time. His work is amply represented in the National Gallery and the National Portrait Gallery of London and the numerous great collections belonging to noble families. In America his pictures are to be found in fewer numbers in the larger museums and in the possession of private collectors. He published ‹Discourses Before the Royal Academy› (1778), and ‹Commentary on Du Fresnoy's Art of Painting.›

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and Times of Sir Joshua Reynolds’ (2 vols., ib. 1865); Malone, ‘The Works of Sir Joshua Reynolds, Knight’ (3 vols., London 1798); Molloy, J. F., ‘Sir Joshua and his Circle’ (2 vols., New York 1906); Northcote, James, ‘Life of Sir Joshua Reynolds’ (2d ed., 2 vols., London 1818); Osborn, Max, ‘Joshua Reynolds’ (in *Künstler-Monographien,* Bielefeld 1908).

**REYNOLDS, William,** American naval officer: b. Lancaster, Pa., 18 Dec. 1815; d. Washington, D. C., 5 Nov. 1879. He entered the navy as midshipman in 1831, was commissioned lieutenant in 1841 and in 1851 was retired in consequence of failing health. He was subsequently assigned to duty in Hawaii where he negotiated a reciprocity treaty, and at the outbreak of the Civil War was again assigned to active duty. In 1862 he received command of the Asiatic station, was promoted captain in 1866, commodore in 1870 and rear-admiral in 1873. He was chief of bureau and acting Secretary of the Navy in 1873 and again in 1874; and in 1877 was again retired on account of continued ill health.

**REYNOLDSVILLE,** rĕn′ōldz-vĭl, Pa., borough in Jefferson County, 75 miles direct and 120 miles by rail northeast of Pittsburgh on the Pennsylvania, the Reynoldsville and Falls Creek and the Michigan Southern railroads. It has bituminous coal mines and an extensive lumber industry, and has flour, silk and woolen mills, a tannery and manufactures macaroni and asbestos. The borough was increased considerably in size by the annexation of several neighboring areas in 1913, including West Reynoldsville with its population of 993. Pop. (1920) 4,116.

**REZONVILLE,** rė-zôṅ-vēl, **Battle of.** See Gravelotte; Franco-German War.

**RHABDOCŒLIDA,** răb-dō-sē′lĭ-dạ, an order of *Turbellaria* which is characterized by the simple, unbranched and rod-shaped alimentary canal. Some forms are very minute and often mistaken for *Infusoria.* Transverse fission is common in certain forms, and the power of regenerating lost parts is very great. A few genera have acquired a strictly parasitic habit, and a few also are marine and land forms, but most are inhabitants of fresh water. In many species two sorts of eggs are produced: summer eggs which are thin-shelled and are retained in the uterus until hatched, and winter eggs, which possess heavy brown shells, and, though produced in the fall, do not hatch out until spring. All *Rhabdocœlida* undergo a simple direct development.

**RHABDOMANCY.** See Divination; Divining Rod.

**RHADAMANTHUS,** răd-ạ-măn′thŭs, according to Greek legend, a son of Zeus and Europa, and brother of Minos, king of Crete. According to another tradition, Rhadamanthus laid the foundation of the Cretan code of laws, which his brother Minos completed. From fear of his brother he is said to have fled to Ocaleia in Bœotia, where he married Alcmene. In the belief of the Greeks a spirit in the lower world continued the business of life, hence Rhadamanthus, after his death, was made a judge in the kingdom of Pluto, or the Islands of Blessed, on account of the justice of his life, and had for his associates Æacus and Minos. The name suggests an Egyptian origin of the myth.

**RHÆTIA,** rē′shĭ-ạ, a Roman province comprising the regions of Rhætia proper and Vindelicia and extending from the land of the Helvetii in Gaul to Noricum on the west, and from Gallia Cisalpina to the Danube. It included within its bounds what are now the Grisons and the Tyrol, the southern districts of Bavaria and Württemberg and the region of the Italian Alps, and contained the sources of the Rhine (Rhenus), the Inn (Alnus) and the Adige (Athesis), with many other rivers of northern Italy. The principal towns were Tridentum (Trent) in Rhætia proper and Augusta Vindelicorum (Augsburg) in Vindelicia. The original inhabitants of the country were considered by most ancient writers to be Etruscans who had been driven out of Italy by the invasion of the Gauls and who under their leader Rhætus took possession of the mountainous country. Modern research has tended to confirm the view of the ancients. The Rhætians were a brave and warlike people and their frequent inroads into northern Italy led to retaliation on the part of the Romans. After a bitter struggle they were subdued in 15 B.C. by Drusus and Tiberius, stepsons of Augustus Cæsar. With Vindelicia, which was conquered at this time, the southern region was united to form the province of Rhætia. Diocletian divided the province into two, giving to the southern part the name of Rhætia Prima, while Vindelicia was known as Rhætia Secunda. After passing into the power of the Ostrogoths in the 5th century the region was overrun by the Boiarii who settled in the eastern part, the Alemanni who occupied the west and the Longobards who established themselves in the south.

**RHAMNACEÆ,** ram-na′ se-e, an order of trees and shrubs. The species, of which about 500 have been described and classified in about 40 genera, are mostly natives of temperate and tropical countries, in which they are widely distributed, especially in the northern hemisphere. They are frequently spiny, have usually simple leaves and inconspicuous, small, greenish blossoms which are followed either by dry fruits which break at maturity into three parts, or by fleshy ones which do not split open when ripe. In several species the fruit is edible as in the jujube (*Zizyphus jujuba*). The red fleshy pear-flavored peduncles of *Hovenia dulcis* are eaten in Japan and China, where the plant is native. Some are important ornamental plants; for instance buckthorn (*Rhamnus*), and New Jersey tea (*Ceanothus*). Various species of the former genus are valued for the yellow and green dyes they yield and *R. frangula* for its charcoal which is used in making gunpowder.

**RHAMPSINITUS,** rămp-sĭ-nĭ′tŭs, a Græcised form of the Egyptian name Rameses, Rameses III, the first king of the 20th dynasty and the builder of the pavilion of Medînet Habu at Thebes. Brugsch makes Rhampsinitos a Greek form of *Ramessu pa nuter* («Rameses the God»); Maspero, *Ramsis-si-nit* («Rameses, son of Neith»); by Diodorus he was called Remphis (Rempsis), from which comes the name Rameses by which Pliny called the monarch. Of him Herodotus (II, 121 et seq.) relates a story substantially the same as one of the most widespread folktales of the Aryan world. The king acquired an enormous treasure, and to secure it built a treasury of stone. The architect left one stone loose, so nicely adjusted as to be unnoticed, yet capable of being taken out and replaced without difficulty. Before death he entrusts the secret to his two sons, who from time to time plunder the king's treasure at their will, until at length the elder is caught in a snare set by the king. According to his desire, the younger brother cuts off and carries away his head, so that he may remain unknown. The king now orders the headless body to be exposed unburied, protected by a guard of soldiers, but the younger brother lades an ass with skins of wine, allows some of it to run out and is relieved in his distress by the soldiers, to whom in gratitude he gives his wines so freely that they all sink into a drunken sleep. Thereupon he shaves the right half of all their beards, and carries his brother's body to his mother. The king next sends his daughter to find out the clever thief. She promises her love to those who reveal to her the most extraordinary things that have ever happened to them, and when the young man in his turn relates the strange passages of his life she seizes him; but he cunningly slips his brother's dead hand into hers, and so escapes. The king is so much struck with wonder and admiration that he promises the clever thief his daughter in marriage, since he surpassed all mankind in knowledge; for, while the Egyptians surpassed all the world, he surpassed the Egyptians.

The wealth of Rameses III is said to have been equal to 400,000 talents, or $387,500,000, an incredible sum for those ages. It is represented on the walls of the palace treasury in the Medînet Habu as consisting of the precious metals and of wonderful jewels.

Herodotus gives the generally accepted story of the supposed thefts from the treasury, but his chronology and historical facts have been proven to be too inaccurate to be relied upon.

**RHAPSODISTS,** wandering minstrels among the ancient Greeks, who sang the poems of Homer and sometimes their own compositions. They were for a long time held in high esteem, until the poems were committed to writing, and through the medium of manuscript copies became pretty generally known, when the rhapsodists soon lost their importance. Each ballad or recitation was termed a rhapsody, and thence it was applied to the separate books of the ‘Iliad’ and ‘Odyssey.’ Consult Browne, H., ‘Homeric Study’ (London 1905).

**RHATANY.** See Rattany.

**RHAZES,** rā'zēs (Abu Bekr Mahammed Ibn Zakhariya Ar-Razi), Arabic physician: b. Rai or Raz (ancient Rhagæ), near Teheran, probably 923 A.D. He acquired great philological and philosophical knowledge, but studied chiefly music. Eventually he became expert in the medical science of his day and was made director of the Bagdad Hospital. There is a story that, when aged, he became blind and refused to have an operation performed upon his eyes, because the surgeon about to undertake it could not tell how many membranes the eye contained. When it was urged that the operation might nevertheless succeed, he still refused, saying that he had seen so much of the world he was weary of it. The best known of the books that pass under his name is ‘Al-Havi,’ but its authenticity is questioned. His treatise on the smallpox and measles is the oldest account in existence of those two diseases. It has been translated several times into Greek and Latin and into English from the Arabic text by Greenhill (1847). His ‘Ketab Al-Mansuri’ is a complete system of medicine drawn from Arabic and Greek sources.

**RHÉ, Île de,** ēl dė rā. See Ré, Île de.

**RHEA,** rē'ạ, an ancient Cretan earth-goddess, daughter of Uranus and Gæa, wife of her brother, the Titan Cronus, and by him mother of the Olympian deities Zeus, Hades, Poseidon, Hera, Hestia, Demeter. She was early identified with the Asiatic nature-goddess, Cybele, the Great Mother, who was worshipped on mountains in Mysia, Lydia and Phrygia. Her Cretan *Curetes* corresponded to the Phrygian *Corybantes,* many of whom mutilated themselves like Attis in the frenzy of their orgies. Rhea was supposed at first to make her home in the towering hills of Asia Minor. It was her delight to tame the ferocious beasts found in these wildernesses, as well as to protect the fair towns lying in their valleys. Thus she became known as Mater Turrita and was represented as wearing a crown, turreted like a wall. Rhea's supposed love for the Phrygian shepherd, Attis, gave much color to her worship. In Pessinus, in Phrygia, there was a cave under Mount Dindymon, where was a large stone supposed to be the heaven-sent image of the goddess, as well as the tomb of Attis. This was the centre of her worship and here the first temple to Rhea is said to have been erected by King Midas. From this centre the worship spread to the neighboring towns and provinces, finally reaching Athens. The worship of Rhea continued long after the decadence of Phrygian civilization. Its introduction into Rome, during the Second Punic War, was the result of a prophecy of the Sibylline Fates which told that her image brought to Rome would expel a common foe. The stone in the cave at Pessinus was, therefore, placed in the temple of Victory in the capital city, a holiday being proclaimed to celebrate the event.

**RHEA,** the generic and usual book-name of the South American ostriches or nandus, which, although true ratite birds and occupying the place of ostriches in the American avifauna, yet differ so greatly from the African species that ornithologists universally rank them as a distinct family (*Rheidæ*) or even order (*Rheæ*). Conforming to the general type of the ostriches, the rheas differ in having three toes with large claws, the head and neck fully feathered, the flowing plumes absent from the wings and especially the tail, the ischiatic instead of the pubic bones forming the pelvic symphysis and the palatal structure peculiar in several respects. Three species of *Rhea* have been described; *R. americana,* found throughout the greater part of South America; *R. macrorhyncha,* which is confined to northeast Brazil and is distinguished by its darker color and longer bill; and *R. darwini,* of southern Argentina, which is smaller and has tarsi covered with small scales instead of scutes as have the others. The newly-hatched young of the latter are said to have the legs feathered to the toes.

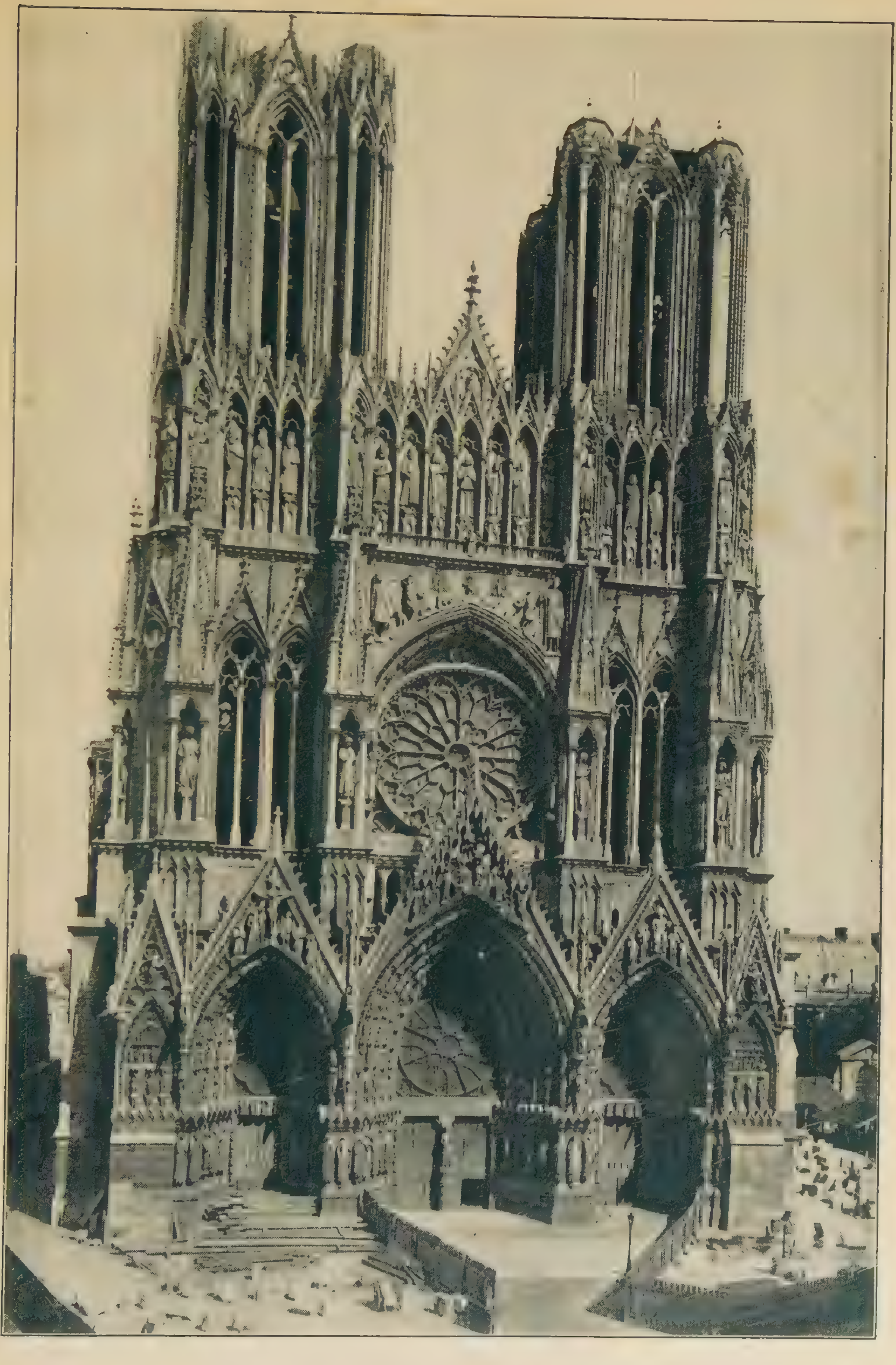
Rheas are known to the natives as nandus or emas (the latter a corruption of emu introduced by the Portuguese) and live in small parties on the pampas and dry plains, where they associate with wild horses, deer and guanacos. In general habits they closely resemble the ostriches (q.v.), but usually run with the wings lowered instead of elevated. They are said to be able to swim across wide rivers. Because of the well-developed syrinx, which is absent in the ostriches, the male rheas have a loud, resonant call, especially heard during the mating season, when they also fight viciously. They are polygamous and the male incubates the score or more of eggs deposited by several females in one nest. They are omnivorous. Although lacking the precious plumes of the ostrich the feathers of the rhea have a commercial value in the manufacture of feather dusters. Many thousands are killed by shooting or with the bolos, or are run down with hounds or horses and clubbed to death. In many places they are threatened with extinction; but, although they breed readily in confinement, no efforts to raise rheas on a commercial scale appear to have been made. Consult Darwin, ‘Voyage of the Beagle’ (New York 1889); Mosenthal and Harting, ‘Ostriches and Ostrich Farming’ (London 1877).

**RHEA, or CHINA GRASS.** See RAMIE.

**RHEA LETTER, The,** in American history, a famous political episode of the time of the Monroe administration. On 6 Jan. 1818, Andrew Jackson, then army department commander in the Southwest, wrote to President Monroe regarding the Seminole troubles in Florida and advising the prompt seizure of East Florida, which he declared could be done “without implicating the government.” He offered to accomplish the seizure himself within 60 days, if it should be indicated to him that it were desirable. John Rhea, a congressman from Tennessee, was the secret channel through which he hoped Monroe's assent might be signified. It was not. In 1831, during Jackson's administration, in the height of his quarrel with Calhoun, which turned in part upon the Seminole affair, Rhea wrote to Monroe, hoping to elicit from him something that would implicate him as approving Jackson's plan. Monroe, on his death-bed in New York, denounced Rhea's insinuations as utterly false.

**RHEES,** rēs, **(Benjamin) Rush,** American Baptist clergyman and educator: b. Chicago, Ill., 8 Feb. 1860. He was graduated from Amherst College in 1883 and from the Hartford Theological Seminary in 1889. He was pastor of the Middle Street Baptist Church, Portsmouth, N. H., 1889–92, and professor of biblical New Testament interpretation (1892–1900) in the Newton Theological Institution, Newton Centre, Mass. He was elected president of the University of Rochester, Rochester, in July 1900, where he is also Burbank professor of Biblical literature. He has published ‘The Life of Jesus of Nazareth: a Study’ (1900); ‘Saint Paul's Experience as a Factor in His Theology’ (1896), also articles in journals and periodicals.

**RHEIMS,** rēmz, Fr. răṅs **(Reims),** France, in the department of Marne, on the Vesle, 100 miles northeast of Paris. Its industries are considerable, embracing, besides champagne, the manufacture of textiles, dyeworks, breweries, distilleries, etc. It is also an important market for raw wool, and its woolen goods, mixed fabrics in silk and wool, merinos, etc., are known in commerce as *articles de Reims.* The old ramparts have been transformed into boulevards, but a few ancient gateways remain, the most noteworthy of which is the Porte de Paris. Rheims was a well-built town and picturesque from the material employed in building and from the prevalence of the older style of architecture. The abbey of Saint Remy was one of the town's principal features; it had become a hospital before the late war. Rheims is a very ancient city. It occupies the site of Durocortorum, mentioned by Julius Cæsar as capital of the Remi, from which people it subsequently took its present name. There are extensive Gallo-Roman remains on the Montagne de Rheims to the south. Christianity may have found entrance into Rheims at an earlier period, but not till the middle of the 4th century did Rheims become a bishop's see. It became a place of importance under Frank rule and was early imbued with a religious character as the scene of the baptism of Clovis and his officers in 496 and to the many solemn and historical rites celebrated in its great cathedral. It became an archbishopric in the 8th century and after 1179, the year of the coronation there of Philip Augustus, it became the place for the coronation of the kings of France, Charles X being the last monarch solemnly crowned there. The only sovereigns, in the long series, not crowned at Rheims were Henry IV, Napoleon I and Louis XVIII. During the frenzy of the Revolution, the cathedral was attacked by the populace, and the sacred oil ampoule was destroyed, in detestation of royalty; and in 1830 the ceremony of the coronation at Rheims was abolished. The most remarkable building is the great cathedral, one of the noblest specimens of Gothic art in all the world. It was built in the first half of the 13th century; is 466 feet long by 99 feet in breadth, with a transept of 160 feet, and a height of 144 feet. Its grandest features were the west façade, which was unrivaled, and the Angel tower, which rose 59 feet above the lofty roof. The baptismal fonts were exquisite and the organ was one of the finest in France. A wealth of tapestry, sculpture and paintings beautified this magnificent structure and innumerable statues of artistic grace adorned the exterior. It is now necessary to write of its glory in the past tense for the Germans by aerial attack and long range artillery fire damaged this glorious edifice beyond repair during the four years in which they were in sight of its towers yet never able after the first fierce onslaught to come within the city. The cathedral is now nothing but a magnificent ruin. The city of Rheims was also laid in ruins by shot and shell. In normal times Rheims had a population of 118,000. See WAR IN EUROPE; and consult Gossett, Alphonse, ‘La cathédrale de Reims’ (Paris 1895); Justinus, J., ‘Reims, la ville des sacres’ (Paris 1860); Marlot, Guillaume, ‘Histoire de la ville, cité, et université de Reims’ (3 vols., Rheims 1843–45); ‘Reims and its Cathedral’ (in *Contemporary Review.* Vol. CVI, New York 1914).



CATHEDRAL OF RHEIMS

(Prior to its Destruction)

**RHEINGOLD, Das.** See NIBELUNGEN RING, THE.

**RHENISH** (rĕn'ĭsh) **ARCHITECTURE.** See GERMAN, *Architecture.*

**RHENISH CONFEDERATION.** See CONFEDERATION OF THE RHINE.

**RHENISH PRUSSIA.** See RHINE, PROVINCE OF THE.

**RHEOSTAT,** in electricity, an instrument invented by Wheatstone for measuring electrical resistances. Two rollers, one non-conducting, and the other of brass, are geared together, so that when either is turned by means of a handle a fine copper wire will be uncoiled from one roller as it is wound upon the other. Two binding-screws, one of them in contact with the brass cylinder and the other with the end of the wire on the non-conducting cylinder, connect the apparatus with the wires of the battery. To use the rheostat, the resistance to be measured is put in circuit with a constant battery and a galvanometer, and the indication of the galvanometer is noted; the resistance is then removed from the circuit, and the rheostat is put in its place, and the handle turned till the galvanometer gives the same reading as before; the resistance of the rheostat is now the same as the resistance which was to be measured, and it is measured by the number of coils of copper wire on the insulating roller. At present instruments working on the same principle, and known by the same name, are used to adjust the resistance of electrical circuits.

**RHEOTROPISM,** that tendency in plants which leads their roots, when immersed in running water, to curve in accordance with the current. Positive rheotropism causes the roots to curve up stream; and negative rheotropism produces the opposite curvature.

**RHESUS,** or **BENGAL MONKEY,** a common Indian macaque (*Macacus rhesus*). It is a strong species with powerful limbs, but without the ruff or beard found in some allied species. The body attains a length of about two feet, and the tail is of medium length. Brown is the prevailing color, but the bare face and the callosities are flesh-colored or red. The rhesus monkey is very intelligent and mischievous, and the young ones can be easily tamed. In several parts of India the Hindus protect this species, for which they have a great veneration.

**RHETORIC** (Gr. *ρήτσρικήτέχνη*, the art of the orator), the skilful use of language for the persuasion or influence of others. Out of this primary meaning of the term have grown other secondary senses. These embrace the artistic use of language, skill in discourse, the power of persuasion, the influence exercised by this power, ostentatious display of language, gaudy and tawdry use of speech, the prostitution of one's honesty and honor by the use of persuasive language employed to gain ignoble ends, artificial oratory as opposed to natural and unaffected speech. Rhetoric thus includes, in the widest use of the term, the art of orator whether written or spoken. It, therefore, includes public speaking, delivery of a discourse, speech, etc., composition, written or spoken, recitation, elocution, with special reference to the scientific rules governing all of these. The ancient Greeks use the term rhetoric largely in the sense of the art of persuasion; and this is the more general sense in which the word is used to-day. Modern writers on the subject of rhetoric have analyzed and dissected the term and followed into all sorts of ramifications, and broadened its scope so as not only to include everything relating to the art of composition but also the investigation of the psychological problems related thereto, the effect of rhetorical speech upon hearers or readers and its reactive effect upon society. While this philosophical aspect of the question is in line with the spirit of scientific investigation of cause and effect, of the age in which we live, it cannot be considered more than an interesting and illuminating commentary upon the subject of rhetoric itself, which in no way concerns itself with moral purpose, its one great object being to persuade an audience by means of the written or spoken word. This was the one primary aim of the American Indian, who gave very great attention to the strict rhetorical form and force of his public speeches.

**The Graphic Word.**— Rhetoric which has been skilfully and artfully employed by savage, barbaric, semi-barbaric and civilized races alike, to the one great end, persuasion, formed the guiding force of the spoken word long before there were writers to define its provinces and uses and to lay down laws for its proper employment and rules for its acquirement. In early times the great orator was looked upon as a person inspired by the gods just as much as were the prophet and the poet. The effective rhetorical use of words to the more primitive mind had something strangely mysterious and divine about it. This is embodied graphically in the Biblical statement: «In the beginning was the Word, and the Word was with God, and the Word was God.» (John i, 1). The idea conveyed in the graphic introduction of John is that of the orator, divine orator creating the world by the power of his word just as the earthy orator moves the imagination and the hearts of men by the beauty and strength of his oratorical presentation of his thoughts. The public utterances of the kings of Egypt were held to be the divinely-inspired words of the highest of their gods, Ra, whose representatives the sovereigns were held to be upon earth; and they were likened to the strong and shining beauty of the great sun himself. In most of the Asiatic countries the power of oratory was accredited to a like divine origin. This idea was carried to its logical conclusion among the Semitic races, and more especially among the Jews, the fiery utterances of whose great priests were held to be the revelations of the divine prophets of the God of gods and the Lord of hosts. Thus throughout the long ages stretching from barbarism to the present, the one great object of oratory and rhetoric has been persuasion, the moving of the minds of men. Among the Jews the rhetorical speeches and writings of their prophets and the lofty religious compositions of their poets, historians and chroniclers were early collected and guarded as the sacred possession of the race.

**Profane Rhetoric and Rhetors.**— At this early period in the history of rhetoric, there could be no rules for its acquirement and use, since that which is held to be a divinely inspired gift cannot be affected by earthly means.

But the practical Greeks and Romans, and before them, to some extent at least, the Babylonian and other cultured races of Asia Minor, had developed orators quite apart from the person of the sovereign and the service of religion. These *rhetors,* as they were called in Greek, were intimately connected with the civic life of the Greek community. Already in the case of these men, the old idea of the divine inspiration of the spoken word had pretty well disappeared or was accepted only in the general sense that ancient tradition is accepted. The rhetors who appeared before the Greek public as public orators, lawyers, prosecutors and defenders, in the legal sense, soon found the great necessity of becoming masters of the principles of rhetoric with their most effective application. This called into being teachers of rhetoric and oratory who gradually organized rhetorical expression into a science far-reaching and all-embracing within its own special province. Aristotle is credited with having made Empedocles the inventor of rhetoric. He probably was one of numerous early Greek teachers each of whom contributed his part to the gradual development of the science of the spoken word; but the real organizer of the art of rhetoric seems to have been Corax of Syracuse who put forth his method about 446 B.C. It was not until some 30 years later that the new method of Corax, as further perfected by one of his pupils, became known in Athens. There it at once became immensely popular with the Athenian orators; and teachers of the Syracuse method of rhetoric sprang up everywhere. Isocrates, himself one of the greatest orators of his age, founded a noted school of rhetoric, whose influence lasted throughout his life and was maintained afterward by his pupils. This influence extended from 390 B.C. to the middle of the latter half of the century. Aristotle (q.v.) who published his rhetoric in 322 B.C. has done perhaps more than any one other man to give a clear perception of the province, object and rules governing rhetoric. Corax, who had produced his system of rhetoric for the democratic lawyers and professional pleaders who had sprung up after the fall of the tyrant Thrasydeus (472 B.C.) and the establishment of a democracy, divided his subject into five parts corresponding to the development of the public speech; poem, narrative, arguments, additional remarks and peroration; and he showed, by illustration, how to develop and use each. His «art» became the basis of the procedure of the subsequently great orators of Greece. Aristotle presented clearly principles given in a very general, concrete manner by Corax. Aristotle's work, which is divided into three books, discusses at length and with wonderful power of analysis the nature and object of rhetoric, the means of persuasion and the manner of handling these means in order to secure the best effects. He divides the province of rhetoric into deliberative, forensic and epidictic. In the latter part of the work he deals at length with expression, the art of delivery and skill in arrangement. The whole book proceeds on the assumption that rhetoric is an art and the province of the teacher is to show to his pupils the true principles of this art the chief aim of which should be to prove one's point or to appear to do so. At length Aristotle discusses in a very scientific manner all the problems of rhetoric and its teachings, as he sees them. So well did he handle his subject that not only did his work take the place of that of Corax, but most writers on rhetoric since his day have followed him more or less closely. For more than 300 years the scientific method of Aristotle formed the basis of rhetoric study and procedure for those orators and schools who followed the purer traditions of Greece; but it was opposed by an increasingly large body of orators and teachers of rhetoric who followed the florid Asiatic style of oratory, depending upon practice for perfection, and decrying scientific rules. These two systems were used by Hermagoras of Temnos (in Æolis) as the bases of a new system of rhetoric which attempted to reconcile the two schools by applying the practice of the one to the scientific exposition of the other (110 B.C.). This became the ruling system of rhetoric in Italy and did much for the training of the foremost Roman speakers, orators and jurists, Cicero, Quintilian (‹De Institutione Oratoria,› 90 A.D.), Longinus (‹Art of Rhetoric,› 260 A.D.) and Aphthonius (‹Exercise,› in 4th century). All contributed important marks on the subject of rhetoric. In the 16th and 17th centuries many *Modern Rhetoric* European universities paid considerable attention to the teaching of rhetoric and their textbooks were for the most part the old Greek and Roman writers already mentioned. After this the teaching of rhetoric in schools and universities gradually became less and less effective, to meet however with a very imperfect revival in the 19th century. Among the well-known works of rhetoric belonging to the Renaissance are ‹The Art or Craft of Rhetoryke,› by Leonard Cox (1540); ‹Art of Rhetorique› by Thomas Wilson (1553); several treatises (in French) by Tonquelin (1555) and Courcelles (1557). To the modern age of rhetoric belong such popular books as Blair's ‹Rhetoric,› Campbell's ‹Philosophy of Rhetoric,› Whately's ‹Elements of Rhetoric› and a large number of textbooks for schools. In the United States there arose, in the latter half of the 19th century, various schools of oratory, rhetoric and dramatic art, which aimed to teach their pupils the principles of rhetoric so as to fit them for the stage, the pulpit and the forum. Teachers in these schools have published works on rhetoric, oratory and dramatic art; but these publications, where really valuable, have been almost altogether based on the principles expounded in the works already mentioned. German and French schools have also paid considerable attention to the teaching of rhetoric from the point of view of the spoken word. All modern universities have departments of rhetoric, though too often the teaching of the rhetoric department is confined to the exposition of the principles of correct and effective composition in prose and verse, without any attempt to apply these principles to practical public speaking. The result of this neglect to combine theory and practice is shown in the very defective oratory and rhetorical presentation by the public speakers of the day.

**Figures of Rhetoric.**— Writers on rhetoric from very early times have distinguished numerous forms of language, which are departures from the straightforward speech of the masses of the people. Such figures are natural to every tongue; and they belong to the uncultured speech of the savage as truly as they do to the most highly cultured language of modern civilization. The human mind constantly works in the same way under given conditions. It thus produces the same kind of figures of speech, which are due to imagery, arrangement of words as a sentence or phrase or to apparent contradiction. It is possible for one figure of speech to contain these three subdivisions. The figures of imagery are metaphor, allegory, synecdoche and metonymy; while those of arrangement consist of climax and antithesis. The figures of contradiction embrace irony, epigram and hyperbole. In addition to these there are numerous minor figures of speech which often belong to two of the above classifications or are merely peculiar sentence structures caused by the form in which the thought is presented. These include asyndeton, apostrophe, apophasis, epanorthosis, negative, interrogation, epistrophe, epiploce, epiplexis, euphemism, antiphrasis and onomatopœia.

**Scientific Investigations.**— Modern students of rhetoric, including dramatic art, have given considerable study to the investigation of the relation of the orator to his audience and to the effect of rhetoric and oratorical display not only upon the actual audience of the speaker or writer but upon society, through the medium of his hearers or the subsequently printed discourse. Some writers have also considered minutely and at great length of mental processes involved in the production of oratorical effects and the kind of faculties involved. They have also given careful attention to the «speech habit» and the best way of acquiring it; and, in connection therewith, they have discussed, from almost every point of view, the character and probable causes of the display in the individual of those superior talents universally recognized as genius. The investigation has been carried into the field of social problems, where experiments have been conducted to show to what extent language is a social bond. See ELOCUTION; ORATORY; SPEECH, FIGURES OF.

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**RHETT,** rĕt, **Robert Barnwell,** American politician: b. Beaufort, S. C., 24 Dec. 1800; d. Saint James' Parish, La., 14 Sept. 1876. He was the son of James Smith, but in 1837 adopted the name of Rhett, a prominent colonial ancestor. He studied law, was elected to the legislature in 1826, and in 1832 was elected attorney-general of the State. He was one of the leaders of the Nullification movement and a more strenuous advocate of States' rights than even Calhoun. In 1837–49 he sat in Congress and in 1850 was elected to succeed Calhoun in the Senate. He stoutly upheld slavery, opposed all compromises and in 1851–52 he urged the secession of South Carolina, whether accompanied by other States or not. After the elections of 1852 Rhett resigned from the Senate and retired to his plantation. He later edited the Charleston *Mercury* in which he advocated his extreme views, and in 1860 he again came into prominence as a member of the South Carolina Convention and was one of the committee which wrote the address giving reasons for secession. He was a delegate to the provisional congress at Montgomery, Ala., in 1861 and later an active member of the Confederate Congress. He removed to Louisiana after the war.

**RHETT, Thomas Grimke,** American military officer: b. South Carolina, about 1825; d. Baltimore, Md., 28 July 1878. He was graduated from West Point in 1845, served in the Mexican War, was brevetted captain for conduct at Puebla in 1847 and in 1858 received rank as major. In 1861 he resigned his commission in the United States army and was commissioned major-general by the governor of South Carolina. He was chief of staff to General Johnston until 1862 and was then assigned to the trans-Mississippi department. He served as colonel of ordnance in the Egyptian army in 1870–73 and then resigned.

**RHEUMATISM,** a constitutional disease marked by inflammation of the connective-tissue structures of the body, especially of the muscles and joints and attended by pain in them. It is frequently recurrent. In a popular sense it covers nearly all forms of painful arthritic and muscular disease. Four forms are recognized in medicine: (1) Acute rheumatism (acute articular rheumatism or acute rheumatic arthritis, acute inflammatory rheumatism, rheumatic fever); (2) chronic rheumatism; (3) rheumatoid arthritis (arthritis deformans, osteoarthritis — chronic articular rheumatism; (4) muscular rheumatism or myalgia. Acute rheumatism, also a milder form known as subacute and chronic rheumatism — may insensibly follow one another — alternating it may be and even the different varieties may co-exist at the same time.

Acute rheumatism is attended with high fever, sour sweat, scanty high-colored urine containing a large amount of urea and swelling of the joints from exudation into their cavities and infiltration around them. The joints are tender and hot. The local symptoms may recurrently pass from one joint to another. There is a tendency to inflammation of the endocardium (endocarditis) and of the pericardium (pericarditis). Predisposing causes of the disease may be heredity, sudden checking of the perspiration in a cold and damp atmosphere, conditions which lower vitality such as chronic alcoholism, nervous debility, worry with exposure, insufficient food, injuries to joints, and excessive muscular work especially in a poisonous atmosphere.

More males than females have acute rheumatism, probably because of more hardship and exposure. It is quite common among farmers, longshoremen, coachmen, stokers, motormen, sailors, scrub-women, etc. It most frequently occurs between the ages of 15 and 30, is rare before the 10th year and after the 50th. The disease is rare in the tropics, common in the temperate zones; in the United States it is most frequent in the early spring and late fall; and it is often endemic and sometimes epidemic. The specific cause in at least the first three forms of rheumatism mentioned above is now generally believed to be a micro-organism, known as a strepto-diplococcus, the «micrococcus rheumaticus,» yet by some writers the various forms of rheumatism are believed to be due to non-neutralized acid poisons of protein metabolism — auto-infection.

The theory of an arthritic diathesis as a cause, and the theory that rheumatic joint lesions are due to disturbances of the nervous system seemed to have passed away. Tonsilar disease has come to be associated with rheumatism and is believed by some to be due to rheumatism, for the most common habitat of the specific germ is in the tonsil crypts, where it may remain quiescent for months or years, until lowered vitality and a sore throat affords a suitable chance for it to do its specific work, in the joints, heart, kidneys, nerves, brain and the various fascia of the body. It is believed that any focal point of suppuration within the body may afford a starting point for infection — if the specific organism is present — as in pyorrhea — middle ear and post nasal discharge, gonorrhea, abscesses, fissures — chronic appendicitis, etc.

The morbid anatomy of rheumatic joints show synovial membrane swollen and hyperæmic; serous infiltration of ligaments and other tissues; joint fluid turbid with albumen, fibrin and leucocytes (pus and blood rarely present); sometimes ecchymoses on cutaneous and serous surfaces. In the blood the red corpuscles are reduced more than one-half; the hæmogloblin is much less than normal, but fibrin and leucocytes are largely increased. There are various complications of acute rheumatism, chorea, conjunctivitis, nephritis, pleurisy, etc., but the most serious are endocarditis and pericarditis. The heart is affected in very many cases, most frequently the left side (rheumatism of the heart), the edges of contact of the mitral valves being swollen and covered with fibrinous masses; less frequently, the aortic valve; rarely, the pulmonary or tricuspid. Contraction and distortion of the affected valves may result. Ulceration is rare. Simple fibrinous or sero-fibrinous pericarditis is common; myocarditis seldom occurs. The attack may begin with headache, indigestion, aching, chilliness, slight tonsilitis or pharyngitis, but usually comes with a chill, followed soon by high fever (may be 103° or 104° F.), swelling, tenderness, heat and shiny appearance of one or more joints (knees most often, then wrists and fingers, ankles, etc.), a coated tongue, foul breath, a soft pulse of 100° to 110°, thirst, constipation and by profuse sour sweat. There is always a tendency to recurrence, complications and migration from one joint to another. The mind is clear, except when the fever is very high. Coma, which is rare, is due either to high fever or nephritis.

So-called cerebral rheumatism is due to a toxic congestion. Sometimes urticaria and spots of ecchymosis appear upon the skin and in children small nodules, firm but movable, are attached to tendons and fasciæ, and are found over the spine, scapula and inflamed joints. Acute rheumatism is to be distinguished from arthritis following scarlet fever and found in the course of other diseases — due also to specific germs — and from acute osteomyelitis, scurvy (in children), gout and gonorrheal rheumatism.

There is a sub-acute rheumatism, very common, with mild symptoms and slow recovery. It may follow an acute attack or be sub-acute from the outset and may pass into the chronic form. Temperature is seldom above 102° F. The so-called acute rheumatism of children is usually sub-acute; the joint-symptoms may be so slight as to be readily overlooked, but there is more liability to cardiac inflammation than in adults. Children perspire less, but are liable to have chorea, tonsilitis and cutaneous manifestations. If not treated acute rheumatism lasts from two to three weeks or more.

Severe cases may recover under treatment within a week; and mild cases last several weeks, so obstinate sometimes is the disease. The joints are not left with fibrinous adhesions unless chronic rheumatism supervenes. Death is rare, and when it occurs it results from high fever, pneumonia, pleurisy or myocarditis. Relapses are quite common. Treatment requires many details. Among preventive measures are care against exposure to cold and damp, especially when overheated; freedom from muscular strain; the wearing of woolen underclothing in winter, and of linen-mesh in summer; abstinence from sweets and malt liquors; very moderate eating of animal food; sponging with cool water, followed by friction; outdoor exercise; and the keeping of the bowels open with Carlsbad water or Rochelle salt. During the attack place the patient between blankets on a comfortable mattress; have him use a bed-pan; carefully dispose the inflamed part in a comfortable position. While the disease is severe give light food, no meat, sweets or malt liquors; allay fever with cool spongings and tincture of aconite; quiet the patient with Dover's powder or codeine; locally apply methyl salicylate, oil of wintergreen, or equal parts of guiacol and glycerin; and keep the part warm with cotton batting, oil-silk, etc. Medicinally, salicin, salol, or salicylate of soda and bicarbonate of potassa or soda, or the citrate of potassa seem to be of most avail.

Chronic rheumatism is a form of chronic joint-inflammation, attended by moderate pain, and by changes in the joints resulting in their deformity. It begins insidiously, or follows attacks of acute or sub-acute rheumatism, and is rare before the 40th year. The predisposing causes are poor hygienic conditions, debility, malnutrition, cold and damp, and occupations which involve the repeated and long-continued use of certain joints, as in the cases of seamstresses and tailors. A moderate thickening and some distortion appear in affected joints (fingers and knees especially) which may be bilateral.

The changes are mainly in the fibrous tissues, though sometimes there is synovial injection and effusion. Erosion of cartilages is seen only in prolonged cases. Endocarditis, pericarditis and pleurisy are rare.

The symptoms slowly develope; general health may be good; pain occurs when joints are red and swollen, and may be severe at night. Joints swell from time to time, and some persons readily predict an attack. The muscles about the joints after a time atrophy and the affected joints are deformed by deflection due to adhesions. Slight fever may accompany attacks. The diagnosis excludes gout and arthritis deformans (qq.v.).

In treatment medicine is of uncertain value. Iron, Vichy water, iodide of potassium and Carlsbad salts or phosphate of soda may be used. More relief is to be obtained from douching and sweating of the joints, massage, protection against cold and damp and injuries to the joints, an ample diet (no sweets, and no alcoholic stimulant except whisky), a dry equable climate and residence at one of the spas. Bee stings have proved valuable.

Rheumatoid arthritis, a better term than arthritis deformans, may follow acute or chronic rheumatism or apparently may start de novo. It frequently is associated with neuritis. It usually does not come to persons under 50 and is an obstinate disease, seldom fully recovered from. It is marked by varying attacks of severe localized or shooting (neuritic) pains, by tenderness and soreness of joints, by contraction and sometimes severe jerks of muscles about the joints and leading to them, by atrophy of muscles, bony nodes about joints and fibrous bands within joints, numbness of heels, constriction about chest and neck, sometimes marked deformity of one or more of the limbs rendering person unable to move the affected limbs. Yet with it all, the afflicted person may live for years, and at times have spells of good general health. Treatment usually unsatisfactory — static electricity, bacterius, local heat, soothing applications, internal medicines (for the physician to advise) — proper food, keeping the bowels clean and living as much as possible in out-door air.

Muscular rheumatism or myalgia is a painful affection of various voluntary muscles and of the fasciæ and periosteum to which they are attached. It is most common in youth and young adults and among those exposed to cold and damp when overheated and those who overuse certain muscles. Heredity, goutiness and lithæmia are predisposing causes. The disease is never fatal, whether it is neuralgic in character or is an inflammation of muscular tissue (myositis) is not determined. The symptoms include local pain and tenderness, increased by contraction or movement of the affected muscle; usually the pain is an intense dull ache. There is seldom any heat, swelling or redness. Occasionally the muscle cramps and is most comfortable if semi-flexed. Sometimes there is fever. In torticollis or stiff-neck (unilateral) some of the muscles of the neck are involved. The patient dreads to move the head, and moves the body instead. In pleurodynia one side is affected (generally the intercostal muscles, but sometimes in the serratus and pectoralis), usually the left. Pain is increased by movements, coughing or sneezing.

Lumbago, a muscular rheumatism affecting the muscles of the lumbar region and their tendinous attachments, is bilateral, quite frequent, and is often caused by strain of the muscles of the loins. An attack often begins suddenly with an excruciating pain when the sufferer is attempting to rise from a sitting posture, or to change his position in bed. If the loin-muscles are kept rigid the patient may be able to move about. Treatment calls for rest of affected muscles (best in bed), the application of heat and anodyne liniments, ironing the loins with a hot flatiron over a few thicknesses of flannel or thick wrapping paper, or galvanism.

Muscular rheumatism is distinguished from neuralgia by localized pain, increased by voluntary movements, and by the absence of tender spots. Recovery usually occurs in a few days, except in debilitated persons, those with rheumatic tendencies or subjects of chronic alcoholism.

Preventive treatment requires freedom from damp and cold, and from muscular strain, sponging and friction, vegetable diet and warm underclothes. Massage and a Turkish bath may prevent an attack. For local treatment rest, heat, turpentine stupes and anodyne liniment are of use. Medicine is of little value. In pleurodynia, strapping the chest, or the use of a wide flannel binder, is often of much service.

**RHEUMATISM-ROOT.** See TWIN-LEAF

**RHEYDT,** rīt, Germany, a town of Prussia, in the government of Düsseldorf, 16 miles west of Düsseldorf, important on account of its industries, which embrace silk and satin goods cottons, and mixed fabrics, foundries and machine-shops, printing and dyeing works, breweries, distilleries, etc.

**RHIGAS,** rī'gạs, **Constantine,** Greek patriot: b. Velestino (the ancient Pheræ) about 1753; d. Belgrade, Serbia, 1798. He wrote not only in Greek but also in French, and was a poet and proficient in music. He formed the bold plan of freeing Greece from the Ottoman Porte by means of the secret association of the Hetæræa, and succeeded even in bringing powerful Turks into his conspiracy. From Vienna he kept up a secret correspondence with the most important confederates in Greece and in other parts of Europe. At the same time he composed in his native language a number of patriotic songs, calculated to inflame the imagination of the Greek youth and embitter them against the Mussulmans. Having been arrested in Trieste he was with several other prisoners conducted to Vienna. Rhigas and three others of those arrested were sent back in chains to Belgrade in May 1798, and put to death by the Turkish authorities. During the Greek War of independence, which ultimately led to the emancipation of their country from the Turkish yoke, his songs were in the mouth of everyone. The most celebrated of them are his translation and adaptation of the 'Marseillaise.' Consult Edmonds, 'Rhigas Pheraios, the Protomartyr of Greek Independence' (1890).

**RHINE,** rīn, a river of Germany. It is one of the most picturesque rivers in the world, and its natural beauty is heightened by the historic and legendary traditions with which its name is associated. Its direct course is 460 miles long and its indirect course about 800 miles; the area of its basin is about 86,600 square miles. It is formed in the Swiss canton Grisons by three main streams called the Vorder, Mittel and Hinter Rhein, or the Upper, Middle and Lower Rhine. The Vorder Rhein rises in the small Toma Lake (7,690 feet high), lying to the northeast of the Saint Gothard, and is augmented by two streams which unite with it near Chiamut (5,380 feet). The Mittel Rhein issues from a small lake west of the Lukmanierberg, traverses the Medelserthal, and joins the Vorder Rhein at Disentis, from which point the united stream is called Vorder Rhein. It takes an easterly direction, and at Reichenau unites with the Hinter Rhein, which issues from the Rheinwald Glacier, in the Adula group, and has a course of about 70 miles through the Rheinwaldthal before reaching Reichenau. Here the stream takes the name of Rhine, has a width of 130 to 140 feet, and admits of floating. The Rhine first becomes properly navigable at Coire after receiving the Plessur. It now turns north, and shortly after being augmented by the Landquart quits the Grisons, forms the boundary between the canton of Saint Gall on the left and Leichtenstein and Voralberg on the right, receiving the Ill from the latter, and enters the Bodensee or Lake of Constance, continued by the Untersee. On issuing from the Untersee it flows west, separating Switzerland from the State of Baden, and continues its course to Schaffhausen and Basel, receiving, as it proceeds, on the left of the Goldach, Thur, Thöss, Glatt and Aar, and on the right the Wutach and Alb, mountain streams of the Black Forest. At Schaffhausen the river forms perhaps the grandest waterfalls in Europe. At Basel it again begins to flow north, when it separates the French territory of Alsace from Baden, forms the boundary between the latter and the Bavarian palatinate, flows thereafter through the grand-duchy of Hesse, forms the boundary first between it and Nassau, and then between Nassau and the Prussian Rhenish province, till it wholly enters the latter at Coblentz. Below Emmerich it enters the Dutch province of Gelderland, and shortly after divides into two branches, a south and a north. The south, called the Waal (anciently Vahalis), carries off two-thirds of its water, and joins the Maas oı Meuse at Woudrichem. The north branch, after making several windings in its course to Arnhem, but still retaining the name of Rhine (Rijn), divides at Westervoort, before reaching Arnheim, into two branches. Of these the right proceeds as the New Yssel, in the bed of the canal which Drusus dug to connect the Rhine with the Old Yssel, till it reaches Doesburg, where the New and Old Yssel unite to pour their accumulated waters into the Zuyder Zee. The left arm proceeds, under the name of Rhine, in a course nearly parallel to the Waal, passing Wageningen and Rhenen to Wijk-by-Durstede, where it again bifurcates, sending a very feeble branch, under the name of the Crooked Rhine, to Utrecht, where, by the canal of Vaart, it communicates with the much larger branch, called the Leck, and flowing past Vianen and Schoonhofen unites with the Maas above Grimpen-op-de-Lek. The Crooked Rhine becomes little better than a ditch; on leaving Utrecht it proceeds toward Leyden, and at the beginning of the 19th century was lost in the sand beyond the Katwijk-aan-den-Rijn. At an earlier period it had here found an outlet into the ocean; and in more recent times, after surmounting many difficulties, the lost water of the Rhine has been collected in a canal, and by the aid of three sluices the outlet has again been established. The breadth of the Rhine and the character of its channel differ much at different parts of its long course. Its breadth at Basel is 750 feet; between Strassburg and Spires from 1,000 to 1,200 feet; at Mainz 1,500 to 1,700 feet, and at Schenkenschanz, where it enters the Netherlands, 2,150 feet. Its depth varies from 5 to 28 feet, and at Düsseldorf amounts even to 50 feet. The Rhine abounds with fish, including salmon and salmon-trout, but more especially sturgeon, lampreys and carp. Wild fowl also abound on its banks and countless islands. Some gold is contained among the sands brought down into it from the mountains of Switzerland and of the Black Forest.

The navigation of the Rhine is very important, particularly for west Germany. The navigation is rendered dangerous by waterfalls, more especially those of Schaffhausen, of Zurzach (near the mouth of the Wutach), of Laufenburg and of Rheinfelden; it is also rendered dangerous by the Bingerloch, near Bingen, where the stream becomes suddenly narrowed and confined between lofty precipices, and by similar causes, though in a less degree, at Bacharach, Saint Goar and at Unkel.

The Rhine is distinguished alike by the beauty of its scenery and the rich fields and vineyards which clothe its banks. Hence no river in Germany, more especially since the introduction of steam-vessels, attracts so many tourists. From Basel to Mainz it flows through a wide valley, bounded on the left by the Vosges, and on the right by the Black Forest and the mountains along the Bergstrasse. From Mainz the mountain ridges approach the stream at first only on the right bank, where they form the Rheingau; but at Bingen they begin to hem in the left bank also, and continue from thence to Königswinter to present a succession of lofty mountain summits, bold precipices and wild romantic views. Pleasant towns and villages lie nestled at the foot of lofty hills; above them on all sides rise rocky steeps and slopes clothed with vines, and every now and then the castles and fastnesses of feudal times are seen frowning from precipices apparently inaccessible. At times the chain of ridges on either side opens out and allows the eye to wander into romantic valleys, along which tributaries of less or greater magnitude keep dashing down or gradually winding to the parent stream. On the river itself much additional variety and beauty are given to the scenery by the constant recurrence of picturesque and verdant islands.

Scarcely a river in the world is of importance to more people than the Rhine. Since long before Cæsar's day this great stream has been the scene of stirring events in the world's drama. Vercingetorix, Charlemagne, Tilly, Wallenstein, Frederick the Great, Napoleon Bonaparte, Bismarck, Moltke, Foch and Pershing, these are some of the illustrious names in the long roll of warriors who strove along its banks for command of this great highway. Famous in song and story, lined with great cities and ruined castles of robber barons, it is the Mecca of tourists at all seasons of the year. Up one side and down the other, or by river from Cologne to Mainz, every mile has its beauties and its legends. Between Darmstadt and Heidelberg the Taunus Mountains shut in its basin on one side, the Odenwald, scene of the Siegfried saga of Wagner's Nibelungen operas, on the other. An ideal region for the man fond of walking tours, for the villages are so close together that no spot along its banks is more than an hour's walk from a village. Cyclists and automobilists find good roads, generally military highways, all the way from Holland to Basel and the Lake of Constance. For the international control of the Rhine as formulated at the Paris Conference in 1919 see War, European. Consult Clapp, E. J., ‘The Navigable Rhine’ (New York 1911); Hugo, Victor, ‘The Rhine’ (Boston 1874); Hunt, ‘The Rhine: Its Scenery and Historical Legendary Associations’ (London 1845); Mackinder, H. J., ‘The Rhine’ (New York 1908); Mansfield, F. M., ‘Cathedrals and Churches of the Rhine’ (Boston 1906); Mehlis, ‘Der Rhein’ (Berlin 1876–79); Stieler, Karl, et alli, ‘The Rhine from Its Source to the Sea’ (2 vols., London 1888).

**RHINE, Confederation of.** See Confederation of the Rhine.

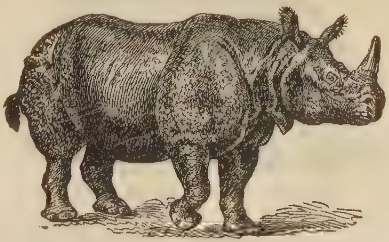
**RHINE, Province of the,** or **RHENISH PRUSSIA** (Ger. *Rheinland*), the westernmost province of Prussia, touching west and north, Luxemburg, Belgium and Holland; greatest length from north to south about 200 miles, greatest breadth about 90; area, 10,423 square miles. It is divided into five governments or districts, Coblenz, Treves, Cologne, Aachen (Aix-la-Chapelle), and Düsseldorf. The city of Coblenz is the official capital of the province, but Cologne is the town of most importance. The southern portion of the province is hilly, being traversed by the ranges of the Eiffel, Hochwald, etc. It is watered by the Rhine, the Moselle and some affluents of the Meuse. A large proportion of the surface is in forest. Besides the usual cereal crops, tobacco, hops, flax, rape, hemp and beet-root are raised; fruit culture and the vine culture are also carefully attended to. Cattle are extensively reared. It is the most important mineral district in Germany, abounding in coal, iron, lead, zinc, etc. The Ruhr and Saar coal districts have aided in the industrial development of the province. It is likewise an active manufacturing district, there being numerous iron works and machine-shops, textile factories, glass works, tanneries, chemical works, sugar refineries, breweries, distilleries, etc. Its textile industries are among the best in the world. There are over 2,900 miles of railway. A large portion of the province came within the neutral zone reserved by the conquering Allies, according to the terms of the armistice of 11 Nov. 1918. (See War, European). Pop. about 7,121,140, of whom 70 per cent are Roman Catholics. Consult Tollman, O., ‘Die Eifel’ (Bielsfeld 1912); Kerp, ‘Am Rhein’ (ib. 1901); Kollback, Karl, ‘Rheinisches Wanderbuch’ (2d ed., Bonn 1897); Mehlis, ‘Studien zur ältesten Geschichte der Rheinlande’ (Leipzig 1875–79); Schwann, ‘Die Rheinlande von Mainz bis Koblenz’ (ib. 1900); Tille, ‘Uebersicht über den Inhalt der kleineren Archiv der Rheinprovinz’ (Bonn 1899–1902).

**RHINE WINES.** See Wine and Wine Making.

**RHINELANDER,** rīn'lăn'dėr, Wis., city, county-seat of Oneida County on the Wisconsin River and on the Minneapolis, Saint Paul and Sault Sainte Marie, and the Chicago and Northwestern railroads, about 100 miles northwest of Green Bay. The Pelican Rapids in the Wisconsin at this place furnish extensive waterpower. It is in a lumbering region, and its chief manufacturing establishments are lumber mills, paper mills, refrigerator works, boat building works, iron works and minor industries. There are several churches, Saint Mary's Hospital, public schools, one parish school and a Carnegie public library. The banks have a combined capital of over $100,000. The government is vested in a mayor and 12 aldermen. Pop. (1920) 6,654.

**RHINITIS.** See Nose and Throat, Diseases of.

**RHINOCEROS,** a massive hoofed mammal of the family *Rhinocerotidæ,* characterized prominently by its nasal horns, the species of which are now confined to South Africa and southeastern Asia, although in past ages of world-wide distribution. These animals are all of large size and ungainly form, and the very thick skin is usually thrown into folds of more or less definite kind, and as a rule is very sparsely haired. The limbs are stout and comparatively short, and terminate in round feet with three toes on each foot, each toe encased in a hoof. The skull is of pyramidal form, with a confluent orbit and temporal fossa, and the nasal bones are very prominently developed, and support one or more «horns,» which grow one behind the other. The muzzle is extended by a more or less elongated pointed and prehensile upper lip; the incisors and canines are diminished but functional in the African species, and entirely wanting in adults of the Asiatic species. The cheek-teeth are massive and their crowns exhibit complexly folded ridges, varying much with the species. The horn of the Rhinoceros is of epidermic origin based upon thickened «bosses» of the underlying bone, but really formed of fibres of horn practically bristles, agglutinated as they grow. When two horns are developed, the hinder one is borne by the frontal bones, and is situated in the middle line behind the front horn. The front horn is generally much larger than the hinder one, the latter, when larger, possessing a different shape from the front structure.



Indian Rhinoceros (*Rh. indicus*).

They serve many useful purposes in savage economy, but are of little service in civilized arts, although formerly the horn was considered to have medicinal and even magical virtues, especially in the detection of poisoned wine.

Although subdivided by some zoologists, the rhinoceroses may properly be regarded as forming only a single genus, *Rhinoceros,* with five existing species, and some extinct species, to which must be added several genera known only by fossil remains.

The most familiar species is the typical one-horned or Indian rhinoceros (*Rh. indicus*), which, like all the Asiatic species, has the skin thrown into very definite folds, corresponding to the regions of the body. The horn of this species is black, very thick, from one to (rarely) two feet long and rises from the tip of the nose. The upper lip is very large and overhangs the lower; it is furnished with strong muscles and is employed by the animal somewhat as the elephant uses his trunk. The skin is naked, rough, extremely thick and of a purplish brown hue. About the neck it is gathered into large folds; a fold also extends between the shoulders and fore-legs and another from the hinder part of the back to the thigh. It is naturally soft and easily penetrated by a rifle-ball or hunting knife, but when suitably dried is exceedingly hard and polishable. The tail is slender, flat at the end and furnished at the sides with very stiff black hairs. The animal was well known to the ancients when it ranged over most of the peninsula of India and was introduced into the games of the circus by Pompey. From the time of the fall of the Roman Empire, however, it was lost sight of so completely, that prior to the 16th century, naturalists were of opinion that it had never existed, or, if so, that it was extinct. When the Portuguese, however, opened the way to India, these animals again became known, and many were introduced into Europe, a historic one, sent by an Indian potentate to the king of Portugal in 1513, stood as model for a well-known drawing by A. Dürer. This species is now much restricted in range and not to be found outside of the plain of Assam, where it confines itself to the marshy grass-jungles, where, like its relative, the tapir, it is fond of wallowing in the mud. Though possessed of great strength and a match for either the tiger or the elephant, it is quiet and inoffensive unless provoked. The female produces one at a birth. The growth of the young is very gradual, as, at the age of two years, it scarcely attains half the height of the adult, which is usually about five feet at the shoulder; such a specimen will measure about nine and one-half feet from the snout to the root of the tail. The sight of this rhinoceros is by no means acute, but, on the contrary, its senses of smelling and hearing are very keen. Its chief food is canes and shrubs. The flesh somewhat resembles pork in taste, though of a stronger flavor and coarser grain. It can be successfully hunted only by the aid of elephants, and is now protected by law against extermination. It lives well in captivity and specimens may be seen in many zoological gardens, but it does not breed in captivity.

African Rhinoceros (*Rh. bicornis*).

The Javanese or Sondaic rhinoceros (*Rh. sondaicus*) is distinguished from the Indian species by smaller size, shorter horn and differences in the disposition and tesselated appearance of the skin-folds, which is also somewhat more hairy. It occurs in the Sunderbunds of India, in Bengal and in the Malayan Islands. The Sumatran rhinoceros (*Rh. sumatrensis*) is well distinguished by having two horns, the rear one like a big knob, and in being clothed with a comparatively thick coat of hairs. Its range is similar to the Sondaic species, but it also extends to Borneo. A variety living in the Assamese swamps has been called the hairy-eared rhinoceros (*Rh. lasiotis*). The upper lip of this species forms a short proboscis and it gets its food mainly by browsing shrubs.

The African rhinoceroses are two, both differing from the Asiatic group in dentition, and in the absence of the armor-like plates and folds in the hide, which is hairless and lead-colored. Considerable variation exists, so that half a dozen or more distinct forms have been named, but all seem referable to two species,—the ordinary widespread African rhinoceros (*Rh. bicornis*), and the square-mouthed (*Rh. simus*). The former is to be found, except where killed off by civilization, throughout all southern and eastern Africa outside of the equatorial forests, and it does not show the fondness for swamps which characterizes the Asiatic congeners. Its front horn is broad and raised as on a base, sharp-pointed and curved slightly backward, while the hinder horn is usually shorter and more conical. The head is rounded. This animal appears to be of ferocious disposition, and is quick and active and greatly feared by the natives. The food consists largely of roots, which it digs out of the earth by aid of its horn. The side of the horn is thus frequently rubbed by contact with the earth. This long horn may attain a length of three to three and one-half feet, and straight ramrods are made from it. The lip is somewhat pointed and prehensile and the animal browses much of the time. It is justly regarded by hunters as one of the most dangerous animals in the world to meet and it often charges from ambush or dashes frantically through a camp, so that many persons have lost their lives by it outside of chosen encounters.

The square-mouthed, white or Burchell's rhinoceros is a northerly and now almost extinct species (*Rh. simus*) which dwelt in east Africa and was distinguished by its huge size, a male standing six and one-half feet high at the shoulder, with the front horn 50 or more inches in length. Its muzzle is short and square, the upper lip being short and its food consisting altogether of grass. Its general habits otherwise are similar to those of the other species.

**Fossil Rhinoceroses.**— These animals begin to be recognizable toward the end of the Eocene Period, both in Europe and North America; but the first form of which much definite knowledge is possessed is *Hyracodon* of the Lower Miocene (White River beds) of the eastern slope of the Rocky Mountains. This was a comparatively small, slightly built animal with a longer neck and limbs than later rhinoceroses show and no trace of a horn is perceptible. Like other early forms it was tridactyl, but in some a rudimentary fourth toe (the fifth) remains on the fore foot. The holarctic Amynadants were of a habit of life not unlike that of the hippopotamus, as is shown by the height of the eyes and nostrils and the tusk-like teeth. They had no horns. «In North America,» says Woodward, «a normal horn does not appear ever to have been acquired, and the race disappeared before the close of the Pliocene. . . . In the Old World, however, the gradual development of the horn can be clearly traced.» The earliest definite European remains are of a hornless rhinoceros (*Aceratherium*), which seems to have ranged over all Europe and Asia, and very similar species lived simultaneously in western North America. One of the latter (*Diceratherium*), of small size, had two callosities on its nose side by side and four digits in the front foot. Typical horned rhinoceroses are to be traced as far back as the middle of the Miocene, and they had all the essential features of the modern ones and no one-horned fossils have been found outside of the Indo-Malayan region. The upper Pliocene species bore horns so large that the septum between the nostrils was ossified for their support. This feature is noticeable in the species (*Rh. leptorhinus*) common in England in the time immediately subsequent to the Ice Age, and reaches its maximum in the great woolly rhinoceros (*Rh. tichorhinus*), whose bones are found in the cave deposits and river gravels from Great Britain to China and whose mummified remains have been taken, like those of the mammoth, from the ice-cliffs of arctic Siberia. It had immense horns and was covered with dense woolly hair. Another huge, but aberrant rhinoceros (named (*Elasmotherium*) roamed over Russia and northern Asia at the same Pleistocene period, which was sometimes 15 feet long, and bore an immense horn rising from between the eyes.

**Bibliography.**— Consult authorities on zoology and sport in India and in Africa. especially Roosevelt, T., ‹Life Histories of African Game Animals› (New York 1914); Blandford, W. T., ‹Fauna of British India› (London 1888–91). For the palæontology of rhinoceroses, consult Osborn, H. F., ‹The Extinct Rhinoceroses› (*Memoirs of the American Museum of Natural History*, Vol. I, Part III, New York 1898); id., ‹Phylogeny of the Rhinoceroses of Europe› (*Bulletin of the American Museum of Natural History*, Vol. XIII, ib. 1900).

**RHINOCEROS-BIRD,** some bird, especially a small white egret, which perches upon the rhinoceros when at rest, searching his hide for ticks and other insects and warns him by its cries of the approach of any intruder. See BUFFALO-BIRD.

**RHINOSCOPY.** See NOSE AND THROAT, DISEASES OF.

**RHIO,** rē'ō, or **RIOUW,** rē-ow', a seaport belonging to the Dutch, in the Indian Archipelago, on the islet of Tandjong Pinang, in a bay on the south side of the island of Bintang, 50 miles southeast of Singapore. It is the capital of a Dutch residency, comprising the Rhio Archipelago, the Linga group and the Tambelan, Anambas and Natuma islands, as well as the districts of Kampar, Siak and Indragiri, on the east coast of Sumatra. The population of the residency is estimated at 108,000.

**RHIZOME,** or **ROOTSTOCK,** *in botany*, a sort of stem found in herbaceous perennials, running along the surface of the ground, or partially or wholly subterranean, sending forth shoots at its upper end and decaying at the other. It occurs in the ferns, iris, etc.; and in the ferns it may be wholly covered with the soil. In the mints, the sand-sedge, couch-grass and other plants the rhizome is long and slender, but in Solomon's Seal, iris, birthroot, etc., it is stouter. Unlike roots, rhizomes bear scaly leaves at the nodes, and they also send down fibrous roots. The stouter rhizomes may act as storehouses of food.

**RHODE ISLAND AND PROVIDENCE PLANTATIONS,** one of the New England States, situated between lat. 41° 18′ and 42° 3′ N., and between long. 71° 8′ and 71° 53′ W.; bounded on the north and east by Massachusetts, on the south by the Atlantic Ocean and on the west by Connecticut. The extreme length of the State from north to south is 48 miles, and the extreme width from east to west is 36 miles. The area is 1,248 square miles, of which 1,067 square miles, including the island, are land surface. The larger part of the State is hilly, but the general elevation is not great; the highest point, Durfee Hill, in the northwest of Providence County, having an altitude of 805 feet. The large inlet known as Narragansett Bay, ranging in width from 12 to 3 miles, and with lesser bays and inlets branching from it, extends 28 miles inland in a northerly direction. It includes a number of islands, Rhode Island, Conanicut and Prudence Island being the largest. Rhode Island is 15 miles long and about three miles wide, and on it is situated the city of Newport. Block Island lies nine miles from the coast. It is a hilly expanse of verdure-clad sand rising boldly from the Atlantic Ocean. The Great Salt Pond which was formerly enclosed within the island is now an open harbor, and other important improvements have been effected, making the island much more accessible and secure for steam and sailing vessels. The rivers of Rhode Island are small, but they supply much of the power used by great industrial establishments. The Blackstone, Pawtuxet, Wanasquatucket, Moshassuck and West River all in the northern part of the State flow into the Providence River, which in turn empties into Narragansett Bay. It is navigable for trans-Atlantic steamers to Providence. All the streams are rapid for the greater part of their course, and on some of them large dams have been built as reservoirs for the mills. These and the natural ponds add greatly to the picturesque effect of the scenery.

**Climate.**— The climate is mild, as compared with that of the greater part of New England. The mean temperature for January is 36° and for July 76°, and the humidity averages between 80 and 95 per cent throughout the year. The rainfall ranges from 40 inches in the northern part of the State to nearly 50 inches on the coast.

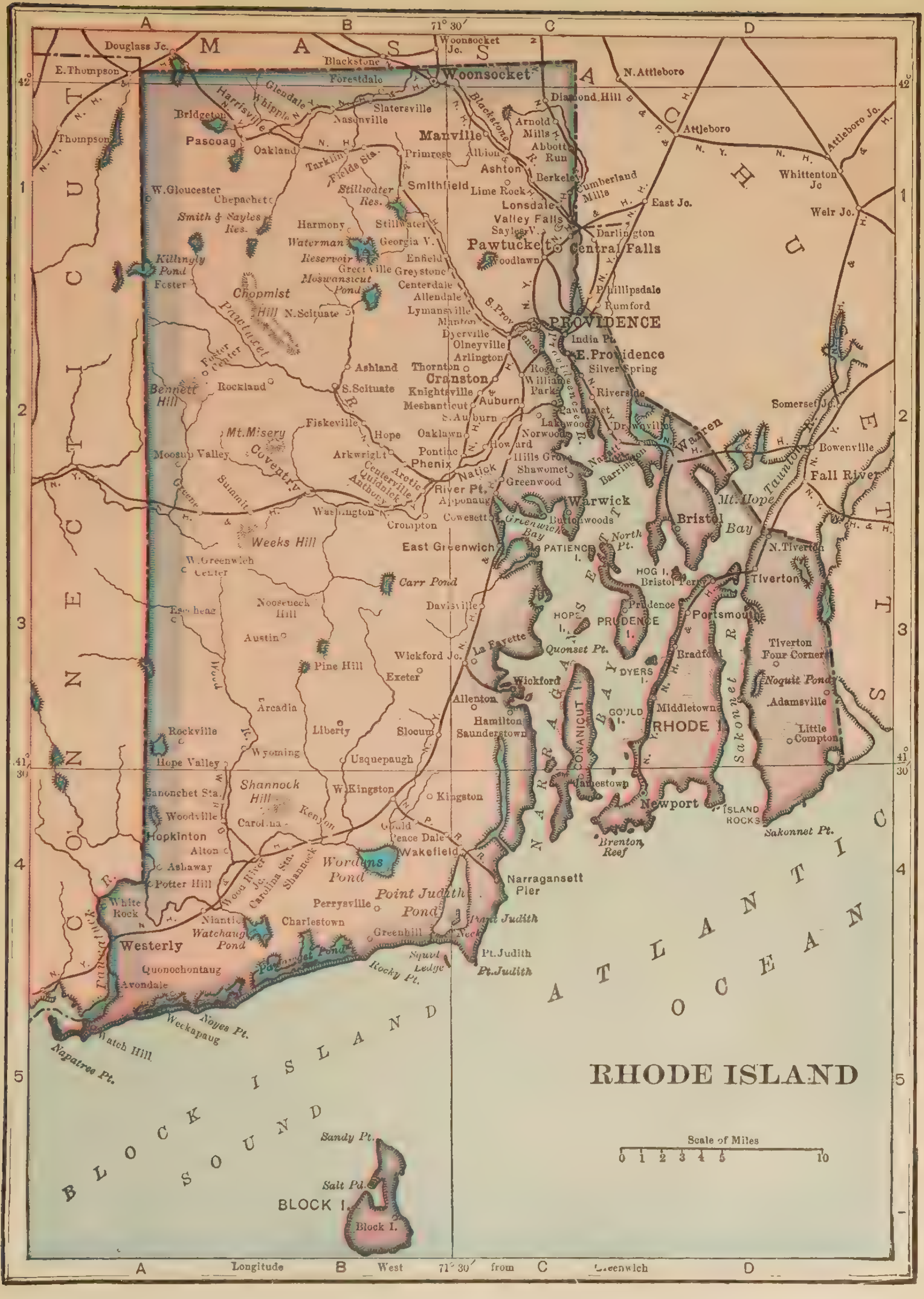
**Geology and Minerals.**— In the western part of the State the surface is chiefly composed of Archæan rocks, which in some places, as at Rocky Point, jut prominently into the bay. The bed of the bay itself, with its islands and a large part of both shores, is composed of deposits from the Carboniferous period, but in the great terrestrial disturbances which followed that period, the coal strata in the vicinity of Narragansett Bay underwent changes which greatly affected their value for use as fuel. Coal was discovered at Philipsdale, East Providence, some years ago. It is claimed that the mine contains good hard coal and can be worked profitably. A coal mine is also located in Cranston, near Providence, which has been worked at intervals for many years, but never far from the surface. Excellent granite quarries are worked in different parts of the State, especially at Westerly, whence granite has been supplied for many notable monuments and buildings throughout the United States. Considerable deposits of magnetic iron ore are known to exist along the western edge of the Carboniferous strata, and limestone is abundant in some parts of the State. In 1919 the total value of the mineral output (graphite, lime, building stone, etc.) was $952,204, as compared with $897,606 in 1909.

**Agriculture.**— Extensive farming is not carried on in Rhode Island. Much of the land has been taken for factory sites, villages and small settlements; while the growth of the cities and large towns has absorbed much suburban property, which was formerly under cultivation. As in other States, many farms are occupied by persons who do not cultivate them to any great extent; farmers who do get a living from their land generally keep cows and from these derive much, if not all, of their income; and this accounts for the fact that hay and forage form a most important crop. The area devoted to this is about 60,000 acres. Corn and potatoes together occupy about one-quarter of this acreage. In Cranston are found some of the largest market garden farms in the United States. Poultry raising is carried on along the most approved scientific lines and yields handsome returns. The State has in all about 4,083 farms, with an area of 331,600 acres, of which 132,855 acres are improved. In 1919 the value of all farm property was $33,636,766. Farm land per acre averaged $79.58. In 1922 the acreage planted to corn was 14,000, from which were produced 560,000 bushels valued at $672,000; in the same year 1,000 acres were planted to oats, yielding 31,000 bushels valued at $19,000; 3,000 acres to potatoes yielding 270,000 bushels valued at $243,000; 45,000 acres to hay, yielding 54,000 tons valued at $1,431,000; a total of 63,000 acres in corn, oats, potatoes and hay, yielding an aggregate product valued at $2,365,000. Vegetables other than potatoes are raised to the value of $700,000 annually. Nursery products, flowers and other ornamental plants are grown in considerable quantities, the annual value being approximately $650,000. The small fruits — strawberries, raspberries, etc.— average about 470,000 quarts with a value of $50,000. The apple crop is valued at about $150,000 annually; while other orchard fruits are placed at $50,000. In a good season the grape crop brings over $20,000. According to present official returns Rhode Island farms have 6,000 horses worth $798,000; 27,000 dairy cows worth $2,268,000; 7,000 other cattle worth $211,000: 3,000 sheep worth $24,000; 12,000 swine worth $217,000; dairy products sold in 1919 were valued at $3,770,528.

**Manufactures.**— The leading industries are the manufacture of cotton and woolen goods, fine tools, machinery, silverware and jewelry. Rhode Island is the parent State of cotton-spinning in America. English laws forbade anyone making a model or drawing of English cotton machinery and sending it out of the country. Samuel Slater, an apprentice to cotton-spinning under Strutt, partner of Arkwright, the great inventor of spinning machinery, mastered the improvements on which he was employed, and came to the United States. Moses Brown invited him to Rhode Island. Slater went, and with the aid of Moses Brown's wealth, he succeeded in producing by the close of 1790, at Pawtucket, R. I., cotton-yarn equal to the best made in England. Cotton-spinning became a great Rhode Island industry, and continued to be the leading industry until the attention of manufacturers was turned largely to woolens and worsteds. The dyeing and finishing of textiles, the silk and silk goods industry and the manufacture of rubber boots and shoes and of electrical apparatus are also among the important and growing industries of the State. In the manufacture of the cheaper quality of jewelry Rhode Island stands first in the United States. In solid silverware the State has no superior. The iron industries are flourishing and include locomotives, engines, screws — the gimlet-pointed screw being a Rhode Island invention — and all varieties of metal tools. According to the Federal census returns of manufacturing establishments in the State in 1919, the capital invested in manufacturing industries amounted to $594,337,448 in 2,466 establishments; there were 2,124 proprietors or firm members, 14,223 clerks or so-called salaried employees, and 139,665 wage-earners. The raw materials were valued at $415,989,203, and the output at $747,322,858. The dyeing and finishing of textiles, with an average of 9,319 wage-earners and an output valued at $42,258,000 in 1919, ranks fourth compared with other industries in the State. Rhode Island ranks fifth among the States in the production of cotton goods, third in woolen and worsted goods, sixth in silk and silk goods and sixteenth in hosiery and knit goods. The cotton mills of the State had in 1919, 2,512,283 spindles, consuming 140,105,134 pounds of cotton valued at $41,491,054.

**Banks.**— The Providence National Bank, founded in 1791, is the oldest Rhode Island bank. The Providence Institution for Savings dates from 1819. In the year ending 30 June 1922 there were 17 national banks in the State, three State banks, 14 savings banks, 12 loan and trust companies. The savings banks had $120,843,000 to the credit of depositors and aggregate resources of $130,278,000.

**Fisheries.**— Oysters, lobsters, scup, menhaden and squinteague are the most important products of the fisheries, which employ about 1,500 persons and approach in value about $1,600,000 annually. About $1,500,000 is invested in the industry. In former years the flats along the bayside produced the clam in abundance which, when baked in the proper way, or the Rhode Island way, is the most delicious of sea


RHODE ISLAND
Scale of Miles
0 1 2 3 4 5 10
Longitude West 71° 30′ from Greenwich
A B C D
1 2 3 4 5
42°
41° 30′
71° 30′
MASSACHUSETTS
CONNECTICUT
ATLANTIC OCEAN
BLOCK ISLAND SOUND
BLOCK I.
Block I.
Sandy Pt.
Salt Pd.
Douglass Jc.
E. Thompson
Thompson
Woonsocket Jc.
Blackstone
Forestdale
Woonsocket
N. Attleboro
Attleboro
Attleboro Jc.
Whittenton Jc.
Weir Jc.
East Jc.
Diamond Hill
Arnold Mills
Abbott Run
Berkeley
Cumberland Mills
Manville
Albion
Ashton
Lime Rock
Lonsdale
Valley Falls
Sayles V.
Darlington
Central Falls
Pawtucket
Woodlawn
Phillipsdale
Rumford
PROVIDENCE
India Pt.
E. Providence
Silver Spring
Riverside
Bridgeton
Pascoag
Harrisville
Glendale
Whipple
Slatersville
Nasonville
Oakland
Tarkiln
Fields Sta.
Primrose
Smithfield
Stillwater Res.
Stillwater
W. Gloucester
Chepachet
Smith & Sayles Res.
Harmony
Waterman Reservoir
Georgia V.
Enfield
Greenville
Greystone
Moswansicut Pond
Centerdale
Allendale
Lymansville
Manton
Dyerville
Olneyville
Arlington
Killingly Pond
Foster
Chopmist Hill
N. Scituate
Pawtuxet
Foster Center
Ashland
Thornton
Cranston
Knightsville
Meshanticut
Auburn
S. Auburn
Rogers Williams Park
Bennett Hill
Rockland
S. Scituate
Fiskeville
Hope
Oaklawn
Pontiac
Phenix
Arkwright
Mt. Misery
Coventry
Moosup Valley
Summit
Greene
Arctic
Centerville
Quidnick
Anthony
River Pt.
Natick
Apponaug
Washington
Crompton
Cowesett
Greenwich Bay
East Greenwich
Weeks Hill
W. Greenwich Center
Carr Pond
Nooseneck Hill
Escoheag
Austin
Davisville
Pine Hill
Wickford Jc.
Exeter
Arcadia
Liberty
Slocum
Rockville
Hope Valley
Wyoming
Usquepaugh
Shannock Hill
W. Kingston
Kingston
Kenyon
Carolina
Gould
Peace Dale
Wakefield
Worden's Pond
Wood River Jc.
Carolina Sta.
Shannock
Canonchet Sta.
Woodville
Hopkinton
Alton
Ashaway
Potter Hill
White Rock
Niantic
Watchaug Pond
Charlestown
Perryville
Point Judith Pond
Greenhill
Westerly
Quonochontaug
Avondale
Pawcatuck R.
Noyes Pt.
Weekapaug
Watch Hill
Napatree Pt.
Rocky Pt.
Squid Ledge
Point Judith Neck
Pt. Judith
Narragansett Pier
Lakewood
Norwood
Hillsgrove
Howard
Shawomet
Greenwood
Warwick
Buttonwoods
PATIENCE I.
North Pt.
Nayatt Pt.
Barrington
Drownville
Warren
Bristol
Mt. Hope Bay
HOG I.
Bristol Ferry
N. Tiverton
Tiverton
Somerset Jc.
Bowenville
Fall River
Taunton R.
HOPE I.
PRUDENCE I.
Prudence
Portsmouth
La Fayette
Quonset Pt.
DYERS I.
Wickford
Allenton
Hamilton
Saunderstown
GOULD I.
CONANICUT I.
Jamestown
NARRAGANSETT BAY
Bradford
Middletown
RHODE I.
Newport
Brenton Reef
Sakonnet R.
Tiverton Four Corners
Noquit Pond
Adamsville
Little Compton
ISLAND ROCKS
Sakonnet Pt.
N. Y. N. H. & H.

# RHODE ISLAND

| | |
|---|---|
| **Abbottrun, (C2)** | **250** |
| Adamsville, (D3) | 300 |
| Albion, (C2) | 950 |
| Allenton, (C3) | 700 |
| Alton, (B4) | 100 |
| Anthony, (B3) | 2,200 |
| Apponaug, (C3) | 1,300 |
| Arcadia, (B3) | 100 |
| Arctic, (B3) | 4,000 |
| **Arlington, (C2)** | **2,500** |
| Arnold Mills, (C2) | 300 |
| Ashaway, (A3) | 700 |
| Ashland, (B2) | 280 |
| **Ashton, (C2)** | **2,000** |
| Auburn, (C2) | 970 |
| Barrington, (C3) | ■3,897 |
| Block Island, (B5) | 900 |
| **Bradford, (B4)** | **400** |
| Bridgeton, (B2) | 600 |
| **Bristol, (C3)** | **■11,375** |
| Bristol Ferry, (C3) | 100 |
| **Canonchet, (A4)** | **100** |
| Carolina, (B4) | 300 |
| Centerdale, (B2) | 3,000 |
| **Centerville,(B3)** | **2,500** |
| **Central Falls,(C2)** | **24,174** |
| Charlestown, (B4) | ■759 |
| Chepachet, (B2) | 1,200 |
| Clayville, (B2) | 300 |
| **Conimicut, (C3)** | **200** |
| **Coventry, (B3)** | **■5,670** |
| Cranston, (C2) | 29,407 |
| Crompton, (B3) | 1,800 |
| Cumberland,(C2) | ■10,077 |
| Cumberland Hill, (C2) | 150 |
| Davisville,(C3) | 580 |
| Diamond Hill, (C2) | 250 |
| E. Greenwich, (C3) | ■3,290 |
| **E. Providence, (C2)** | **■21,793** |
| Escoheag, (B3) | 100 |
| Esmond, (C2) | 500 |
| **Exeter, (B3)** | **■1,033** |
| Fiskeville, (B3) | 900 |
| Forestdale, (B2) | 400 |
| Foster, (B2) | ■905 |
| **Foster Center, (B2)** | **600** |
| Georgiaville, (B2) | 1,000 |
| Glendale, (B2) | 370 |
| Gould, (B4) | 100 |
| **Grants Mills, (C1)** | **300** |
| Greene, (A3) | 460 |
| Greenville, (B2) | 990 |
| **Greystone, (B2)** | **800** |
| **Hamilton, (C3)** | **300** |
| Harrisville, (B2) | 2,200 |
| Hillsgrove, (C3) | 1,200 |
| Hope, (B3) | 850 |
| Hope Valley (B4) | 1,450 |
| **Hopkinton, (C4)** | **■2,316** |
| Howard (C2) | 900 |
| Hughesdale, (B2) | 450 |
| Island Park, (D3) | 225 |
| Jamestown, (C4) | ■1,633 |
| Kent, (B2) | 170 |
| Kenyon, (B4) | 150 |
| Kingston, (B4) | 450 |
| La Fayette, (C3) | 500 |
| **Lakewood, (C2)** | **650** |
| Liberty, (B3) | 100 |
| Limerock, (C2) | 400 |
| Little Compton, **(D3)** | **■1,389** |
| Longmeadow, (C3) | 350 |
| Lonsdale, (C2) | 4,000 |
| Lymansville, (C2) | 700 |
| **Manville, (B2)** | **4,700** |
| Mapleville, (B2) | 610 |
| Middletown, (C3) | ■2,094 |
| Narragansett, (C4) | ■993 |
| **Narragansett Pier** (C4) | 650 |
| Nasonville, (B2) | 550 |
| **Natick, (B3)** | **2,400** |
| **Nayatt Pt., (C3)** | **200** |
| Newport, (C3) | 30,225 |
| Nooseneck Hill,(B3) | 200 |
| No. Scituate, (B2) | 1,050 |
| No. Tiverton, (D3) | 1,650 |
| **Norwood, (C2)** | **650** |
| Oakland, (B2) | 490 |
| Oakland Beach, (C3) | 500 |
| Oak Lawn, (C3) | 400 |
| Pascoag, (B2) | 3,000 |
| Pawtucket, (C2) | 64,248 |
| Peace Dale, (C4) | 1,550 |
| Phenix, (B3) | 3,099 |
| Phillipsdale, (C2) | 700 |
| **Pt. Judith, (C4)** | **100** |
| Pontiac, (C3) | 1,900 |
| Portsmouth, (D3) | ■2,590 |
| **Potter Hill,(A4)** | **250** |
| PROVIDENCE, (C2) | 237,595 |
| Prudence, (C3) | 200 |
| **River Point, (B3)** | **3,500** |
| Riverside, (C2) | 2,000 |
| Rockland, (B2) | 400 |
| Rockville, (A3) | 250 |
| **Rumford, (C2)** | **500** |
| Saunderstown, (C3) | 200 |
| Saylesville, (C2) | 990 |
| **Shannock, (B4)** | **270** |
| **Shawomet, (C3,** | **100** |
| Slatersville, (B2) | 1,850 |
| Slocum, (B3) | 250 |
| Smithfield, (B2) | ■3,199 |
| So. Foster, (B2) | 100 |
| **So. Portsmouth, (D3)** | **500** |
| So. Scituate, (B2) | 300 |
| Stillwater, (B2) | 150 |
| Summit, (B3) | 220 |
| Tarkiln, (B2) | 190 |
| Thornton, (B2) | 900 |
| Tiverton, (D3) | ■3,894 |
| Tiverton Four Cor**ners, (D3)** | **325** |
| Usquepaugh, (B4) | 100 |
| Valley Falls, (C2) | 5,000 |
| Wakefield, (C4) | 2,750 |
| **Warren, (C3)** | **■7,841** |
| Warwick, (C3) | ■13,481 |
| Washington, (B3) | 660 |
| Watch Hill,(A4) | 220 |
| **W. Barrington,(C3)** | **900** |
| Westerly, (A4) | ■9,952 |
| W. Gloucester, (A2) | 100 |
| W. Greenwich, (B3) | ■367 |
| **W. Kingston, (B4)** | **250** |
| West Warwick, (C3) | ■15,461 |
| **White Rock, (A4)** | **350** |
| **Wickford, (C3)** | **1,050** |
| Wood River Jc., (B4) | 150 |
| Woodville, (B4) | 200 |
| Woonsocket, (C2) | 43,496 |
| Wyoming, (B3) | 390 |

■ = Population of township

foods. The «Rhode Island Clam Bake» is a State institution known the world over. While clams are not as plenty now as formerly, the supply is sufficient for many years yet to come. The fisheries of Narragansett Bay were menaced for a number of years by the lack of a proper method of sewage disposal, but the city of Providence at a very great expense has provided a system of clarifying the sewage and this evil has been entirely removed. The total annual product of the lobster fisheries, according to the latest available data, was 1,425,000 pounds, valued at $152,000. This branch of the fisheries has been the especial study of the Commission on Inland Fisheries which, after many experiments, has devised a method of rearing young lobsters until they become able to take care of themselves, thus making it possible to increase greatly the number of lobsters inhabiting the waters of the State.

**Railways.**— The New York, New Haven and Hartford Railroad Company controls railroad operations in the State. The railroads within the State comprise 202 miles of single track and a total mileage of all tracks operated of 446.40 miles and 359.96 miles single track of electric railway. The total length of single track, operated steam and electric, is 562 miles; the net income, steam and electric, amounts to about $10,000,000 annually. After a long period of controversy over location and terms for the disposal of the so-called «Cove Lands,» in the centre of the city of Providence, and over which the tide formerly ebbed and flowed, a union station was erected where all railroads now enter.

**Commerce.**— The export commerce from Rhode Island ports is insignificant. Receipts from foreign imports at the port of Providence for the year ending 30 June 1921, amounted to $375,095, which included the custom districts of Providence and Newport. Congress has made liberal appropriations for the improvement of harbor facilities at Block Island. The wharves at Providence and other ports, which once gave room to Indiamen, whalers and privateers, now accommodate steamers and other vessels used in the coastwide trade and summer travel. The boat-building industry of Bristol is known the world over on account of the Herreshoffs, who have constructed several successful defenders of the America's Cup. Narragansett Bay has become a pleasure resort from Providence River to Newport in the east and Point Judith in the west, and in this way a large amount of money is brought into the State while wealthy men from New York and elsewhere, with summer homes in Rhode Island, have selected the State as their legal residence and pay personal taxes there.

**Finance.**— Since the State recovered from the final disorder occasioned by the War for Independence its credit has always been of the highest, and its obligations promptly met. The construction of the new State House at Providence and other improvements due to the growing needs of the commonwealth have led to extraordinary expenditures within recent years and at the close of the year 1922 the net indebtedness was $11,527,000. On 1 Jan. 1922 the balance in the State treasury amounted to $1,422,911.81; the revenues during 1922 amounted to $7,174,524.67, making a total of $8,597,436.48. The expenditures for the same year aggregated $6,803,367.98, leaving cash on hand 1 Jan. 1923 at $1,794,068.50. The assessed value of the property within the State in 1922 was real property, $642,139,076; personal property, $405,251,141, making a total of $1,047,390,217.

**Population.**— Rhode Island was the most densely inhabited State in the Union by the census of 1920, which gave 604,397 as the total population of 566.4 inhabitants to the square mile. It is the only State east of the Mississippi River where a majority of the population are not natives of the State. In 1920 the population by sex and birth was:

| | White | Negro | Asiatic Indian | Total |
|---|---|---|---|---|
| Male....... | 292,131 | 5,096 | 297 | 297,524 |
| Female...... | 301,849 | 4,940 | 84 | 306,873 |
| Total... | 593,980 | 10,036 | 381 | 604,397 |

The foreign-born whites numbered 173,499, of whom Canada contributed 20.9 per cent; Ireland 12.8 per cent; England 14.9 per cent and Italy 18.6 per cent. The chief city is Providence (q.v.) which (1920) had a population of 237,595; other cities are Pawtucket, 64,248; Woonsocket, 43,496; Newport, 30,255; Warwick, 13,481; West Warwick, 15,461; Central Falls, 24,174; Cranston, 29,407; East Providence, 21,793. The urban population is 97.5 per cent of the whole. In 1920 there were 15,257 births in the State, 6,737 marriages and 8,689 deaths. The death rate in cities was 14.4 and in rural districts 13.0 per 1,000 of the population.

**Education.**— Rhode Island has excellent public schools, supported by local taxation and administered by local authority, and under the general supervision of a commissioner of schools. Education is compulsory, and while there is much illiteracy among certain classes of foreigners, parents, almost without exception, show eagerness to have their children educated. In 1920 the school population of the State was 151,314, of whom 96,190 were enrolled in schools. The State Normal School at Providence is a handsome building, and the State also maintains a College of Agriculture and the Mechanical Arts. The leading educational institution of the State, and one of the best in the United States, is Brown University. The Rhode Island School of Design furnishes educational advantages in the arts of the highest order. Since 1914 the minimum school term is 36 weeks. High schools are provided by every town.

**Religion.**— The First Baptist Church of Providence, said to be the first in America, dates back to 16 March 1639. Roger Williams was one of the organizers. The Quakers were among the early settlers, seeking refuge from persecution in Massachusetts, and the Friends' School at Providence is one of Rhode Island's best-known educational institutions. The Congregationalists did not venture into Rhode Island until 1721, and while their proposal to come there was received with some bitterness by the descendants of those whom their ancestors had driven into the wilderness, they have become one of the leading denominations in the State. While Roman Catholics were as free to worship in Rhode Island as members of any other creed, it was not until 1813 or 1814 that mass was publicly celebrated in the city of Providence; the church of Saints Peter and Paul was completed in 1838. The present handsome cathedral stands partly on the site of the old church, and the Roman Catholic faith now includes about 275,000, or 46.1 per cent of the entire population of the State. ('Official Catholic Directory' for 1921). The Baptists have almost one-third of the total Protestant church membership, and the Episcopalians, who celebrated in 1872 the 150th anniversary of the old Saint John's Church at Providence, have about one-fifth. The Methodists date back in Rhode Island to 1787, and have a large membership and prosperous churches. The Universalists settled in Providence in 1772, and have since had a prominent share in the religious life of the State, besides having been instrumental in fostering many important public charities. The Presbyterians are increasing in numbers and have flourishing places of worship. Rhode Island contains its proportion of other sects and creeds, including the Jews, who were among the early settlers of Newport, where some of them achieved eminence.

**Government.**— There are 33 towns and six cities within the State. The governor, lieutenant-governor, secretary of state and other State officers are elected for two years. The governor may exercise the power of veto and can pardon criminals, with the advice and consent of the senate. The members of the legislature, known officially as the general assembly, are elected for two years. In the upper house, called the senate, there is one senator for each city and town. The lieutenant-governor presides over this body. The lower house, or house of representatives, shall never exceed 100 members and no town or city shall have more than one-fourth of the whole number of members. Members of the general assembly are paid for actual attendance, with a maximum limit of 60 days. The house alone has the power to impeach, and the senate tries cases of impeachment.

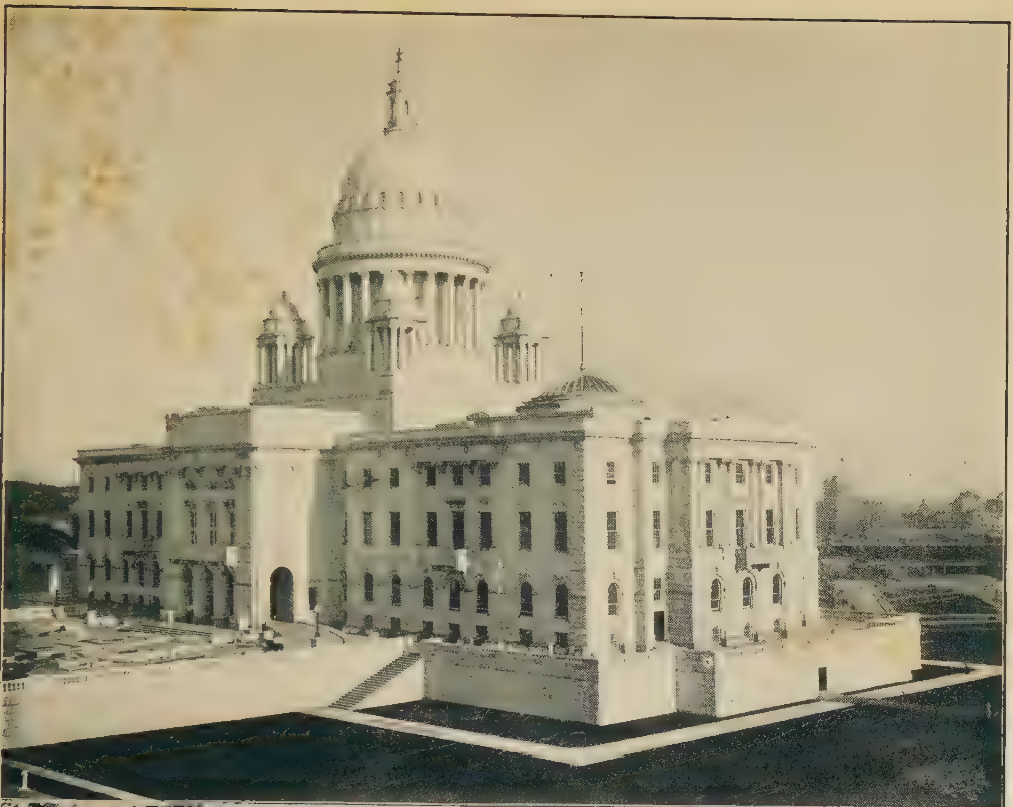
The judicial power is vested in the Supreme Court and in such inferior courts as the general assembly may from time to time establish. Preliminary examination of persons charged with serious crimes and trials for minor offenses are held in the District Courts, the justices of which are chosen by the general assembly. The justices of the Supreme Court are elected by the general assembly in grand committee and continue in office until their positions are declared vacant by a resolution of the general assembly. In practice this has meant election for life, or until retirement by voluntary resignation. The presidential suffrage was extended to women in April 1917.

**History.**— The colony originally consisted, as the name indicates, of more than one community of independent origin, but to Roger Williams, the founder of Providence Plantations, history accords the distinction of having established the commonwealth. Providence Plantations was founded in 1636 by Roger Williams, who fled with several companions from Puritan persecution. He was of Welsh origin, and of respectable family, and his arrival in Massachusetts, 5 Feb. 1631, is recorded as «the coming of a godly minister.» Williams soon showed that he had no sympathy with the Massachusetts principle of controlling through the civil government the consciences of men, and he frankly avowed his views in this regard. He thus incurred the censure of the Puritan magistrates and it was at first resolved to expel him from the colonial bounds, and when it was learned that he proposed to found another colony, it was determined to send him back to England. Williams received timely warning of this intention and he fled into the wilderness with several companions, and at the opening of spring in 1636 he began to plant on the east side of the Seekonk River. He had five companions, William Harris, John Smith, Francis Wickes, Thomas Angell and Joshua Verin. Here he was allowed to rest, being notified by Plymouth Colony that the place was within their jurisdiction. Some time between the end of April and the latter part of June 1636 he proceeded around what is now Fox Point and up Providence River, landing at the site of the future town, and here he selected a dwelling-place for himself and his associates. His object, as set forth by himself, was «the settling of the plantation, and especially for the receiving of such as were troubled elsewhere about the worship of God.»

The settlement of Rhode Island was at first a separate colony, but it also owed its origin to the example and advice of Roger Williams. John Clark and others of Boston went to Providence in 1638 in search of an asylum where they might enjoy liberty of conscience. Roger Williams advised them to purchase from the Indians the large island on the east side of Narragansett Bay called by the Dutch «Roode Eylandt.» This was done, and the adventurers, 18 in number, incorporated themselves as a body politic and elected William Coddington their chief magistrate. A third settlement was formed at Warwick in 1643 by a party of whom John Greene and Samuel Gorton were leaders.

Roger Williams perceived that the union of the weak settlements and the protection of the home government were necessary for their protection from the hostile and comparatively powerful Puritans, and in 1643 he went to England and brought back in the following year a charter which united the settlements of Providence and Rhode Island under one administration, the name of the colony being Rhode Island and Providence Plantations. The new government went into operation in 1647, when the freemen of the several plantations met at Portsmouth, 19 May, and adopted laws for carrying on the civil government. This charter was confirmed by Cromwell in 1655, and in 1663 Charles II granted the celebrated charter which remained for 180 years the supreme law of Rhode Island, both as colony and State, and gave place to a State constitution in 1843 only after the civil convulsion known as the Dorr Rebellion gave notice that the people were determined upon a change.

The colony suffered greatly in the war with King Philip. Providence was burned, and the outer settlements were laid waste and settlers murdered. The Great Swamp Fight, on Rhode Island soil, broke the power of the hostile Indian confederacy, and when King Philip was



1 The State House, Providence

2 The Old Stone Mill, Newport

slain by treachery in the fastnesses of Mount Hope, the red men ceased to be a menace to the security of the settlements.

When Sir Edmund Andros was made governor of New England by James II he sought to take away the colonial charters, and in 1687 attempted to seize that of Rhode Island, but in some mysterious manner it disappeared and was not found until the accession of William and Mary in 1689. Roger Williams had died in 1683. Notwithstanding the harsh treatment he had received from the authorities of Massachusetts he was ever ready to use his influence with the Indians in behalf of the colonies, and he was instrumental in disarming Indian hostility at times when the colonists were ill-prepared for defense. Although a strong controversialist and bold and unsparing in his denunciation of those with whom he did not agree, he had a remarkable faculty of commanding the affection and esteem of men, as was signally shown in his ability to obtain for his colony the protection alike of Cromwell and of Charles II. He was exemplary in his private life and altogether worthy of the reverence which posterity, without regard to creed, attaches to the memory of him whom Whittier has truly called «soul-freedom's brave confessor.» He imprinted on Rhode Island a character which it has never lost, and which has been handed down through all the varying changes of population, of liberality and tolerance, of the Sermon on the Mount interpreted in the ordinary every-day actions of men.

The colony grew with a steady and wholesome growth and religion flourished, although unsupported by the compulsory contributions of worshippers. The people were engaged in agriculture and commerce, and, in times of war, in privateering. During the struggle between Great Britain and France for empire in North America, Rhode Island took an active share in supplying troops and seamen, and the colony had 50 privateer vessels, manned by 1,500 sailors, at sea in 1756. The passion for privateering, with its excitement, its tests of courage and endurance and prospects of rich reward, became so strong that when Esek Hopkins was commander-in-chief of the Continental navy, with his vessels at Providence, he found it impossible to man them, owing to the fact that privateering offered better inducements. The coast of the colony was infested with pirates in the early part of the 18th century, and some 30 of these ocean highwaymen were hanged at one time at Newport.

It was difficult in earlier years to obtain men to fill the minor public places, and laws were passed which remained on the statute-books for many years, providing penalties for refusal to accept office. This modesty on the part of the forefathers is easier to understand in view of the fact that the expenses of the town of Providence at the outbreak of the Revolution did not exceed $1,000 a year.

The people of Rhode Island were among the foremost in defending American rights against the aggressions of George III and his ministers. In June 1772 a band of volunteers commanded by Abraham Whipple, who had distinguished himself as captain of a privateer in the wars against the French, burned the British revenue schooner *Gaspee* in Narragansett Bay. During the greater part of the War of Independence Newport was occupied by the British, and on 29 Aug. 1778 a severe engagement was fought between the Americans, under Sullivan, and the British at Butt's Hill, R. I., in which the British suffered the greater loss. During the war the State furnished nearly 12,000 enlisted men.

Rhode Island was the last of the States to ratify the Federal Constitution, its assent not having been given until 29 May 1790, more than a year after the national government had gone into operation. As a small State, Rhode Island was peculiarly jealous of its rights, and was slow to assent to its adoption. As the Constitution was first formulated and adopted by some of the original States there was room for a well-grounded fear that the smaller States might be destroyed and absorbed through combinations of their more powerful neighbors. It was this fear mainly that caused Rhode Island to stand aloof from the combination, and it was not until that fear had been allayed by amendment to the original instrument that its adoption by the State was effected.

For some years after the Revolution the shipping of the State, being free from British restriction, became known in all parts of the globe then visited by vessels, and the foundations were laid of large fortunes afterward invested in manufacturing, when the shipping business declined. This change took place early in the 19th century, when New England's foreign commerce was practically ruined by the embargo, and when, on the other hand, the War of 1812 gave an impulse to domestic manufactures. Factories were established on every stream that afforded water-power, and Rhode Island grew in prosperity with her expanding industries.

The charter of Charles II, which continued to be the fundamental law of the State, restricted the right of suffrage to freeholders having an estate worth $134, or renting for $7 a year, and to their eldest sons. This was the cause of many wrongs, and of widespread popular protest. It was not uncommon for persons holding mortgages to threaten to foreclose them in order to influence votes, and the system gave rise to much intimidation and corruption. The conservative element strongly opposed a change, and when attempts to obtain reform through the regular course of legislation failed, representatives of the suffrage reform party met in convention and framed a constitution. They claimed that this constitution had been adopted by a majority of the adult male citizens of the State, and it was also alleged that a majority of those entitled to vote under the King Charles charter had voted in favor of the constitution. State officers and a legislature were chosen under this constitution, and organized with Thomas W. Dorr as governor. The charter officials, under Gov. Samuel W. King, ignored the Dorr legislature and its enactments, and Governor King, at the head of a military force, dispersed the so-called insurgents. Dorr was convicted of treason and sentenced to imprisonment for life, but he was released some years later, and his sentence ordered expunged from the records of the State. A new constitution was adopted in regular form, and went into effect in May 1843. It retained the real estate qualification for foreign-born citizens, and this was not abolished until 1888.

Another important change adopted later was that permitting election by a plurality vote. This came into effect in 1893. When a majority was required the election was often thrown into the general assembly, which sometimes chose a minority candidate. Until 1900 the State had two seats of government, the organization of the State government and one session of the legislature being held at Newport in May. Now all sessions are held in Providence, in the splendid new State Capitol.

As a manufacturing State, Rhode Island has been largely influenced by tariff interests in its attitude on national elections, and since 1856, with one exception, the year 1912, it has always given its electoral vote to the Republican candidates. The Democrats have been successful several times within the past two decades, however, in electing their candidates for governor. Rhode Island has adopted the so-called Australian ballot system of secret voting.

Political power is unequally divided. Each city and town, no matter how large or small, has but one representative in the senate, or upper branch of the general assembly, and the representation is also disproportionate in the lower branch. The city of Providence, with nearly one-half the population of the State, and contributing nearly one-half of the State taxes on general property, elects only about one-eighth of the State legislature. In this respect Rhode Island is a miniature of the national government. It is also a singular fact that in Rhode Island's civil conflict, the Dorr "war," the northern part of the State chiefly supported one side, the Dorrites and the southern part stood by the charter.

In the Civil War, Rhode Island supplied 24,102 men for both the army and navy, Gen. Ambrose E. Burnside, for a time in command of the army of the Potomac, and whose equestrian statue is a conspicuous feature of the city of Providence, joined the service from this State, of which, however, he was not a native, and later was honored by its people by being elected governor and United States Senator. Rhode Island spared no expense in sending troops to the front, and since that great conflict has been generous in caring for her disabled and dependent defenders, and maintains a well-regulated Soldiers' Home at Bristol. The Soldiers' Monument opposite the City Hall in Providence, one of the finest in the United States, bears the names of the gallant dead who fell in defense of their country. In the Spanish-American War, the conflict in the Philippines and in the Mexican crisis and the late great World War Rhode Island has been well represented. See BOUNDARIES OF THE UNITED STATES.

## GOVERNORS OF RHODE ISLAND.

The State originally consisted of four towns, Providence, settled in 1636; Portsmouth, in 1638; Newport, in 1639, and Warwick, in 1642. The executive heads of Portsmouth and Newport were entitled judges, until 1640, when these two towns were united, and the chief officer was thereafter called governor. Providence and Warwick had no executive head until 1647.

### PORTSMOUTH

| | |
|---|---|
| William Coddington, judge.. | 7 March 1638–30 April 1639 |
| William Hutchinson, judge.. | 30 April 1639–12 March 1640 |

### NEWPORT

| | |
|---|---|
| William Coddington, judge.. | 28 April 1639–12 March 1640 |

### PORTSMOUTH AND NEWPORT

William Coddington, governor, 12 March 1640–19 May 1647

In 1647 the four towns were united under a charter or patent granted in 1643 by Parliament.

### PRESIDENTS UNDER THE PATENT

| | |
|---|---|
| John Coggeshall | May 1647–May 1648 |
| Jeremy Clarke[1] | May 1648–May 1649 |
| John Smith | May 1649–May 1650 |
| Nicholas Easton | May 1650–Aug. 1651 |

In 1651 a separation occurred between the towns of Providence and Warwick on the one side, and Portsmouth and Newport on the other.

### PROVIDENCE AND WARWICK

| | | |
|---|---|---|
| Samuel Gorton | President. | October 1651–May 1652 |
| John Smith | " | May 1652–May 1653 |
| Gregory Dexter | " | May 1653–May 1654 |

### PORTSMOUTH AND NEWPORT

| | | |
|---|---|---|
| John Sanford, of Portsmouth | President. | May 1653–May 1654 |

In 1654 the union of the four towns was re-established.

| | | |
|---|---|---|
| Nicholas Easton. | President. | May 1654–12 Sept. 1654 |
| Roger Williams.. | " | Sept. 1654–May 1657 |
| Benedict Arnold. | " | May 1657–May 1660 |
| William Brenton. | " | May 1660–May 1662 |
| Benedict Arnold. | " | May 1662–25 Nov. 1663 |

### UNDER THE ROYAL CHARTER

| | |
|---|---|
| Benedict Arnold | Nov. 1663–May 1666 |
| William Brenton | May 1666–May 1669 |
| Benedict Arnold | May 1669–May 1672 |
| Nicholas Easton | May 1672–May 1674 |
| William Coddington | May 1674–May 1676 |
| Walter Clarke | May 1676–May 1677 |
| Benedict Arnold[2] | May 1677–20 June 1678 |
| William Coddington[2] | 28 Aug. 1678–1 Nov. 1678 |
| John Cranston[2] | 8 Nov. 1678–12 March 1680 |
| Peleg Sanford | 16 March 1680–May 1683 |
| William Coddington, Jr. | May 1683–May 1685 |
| Henry Bull | May 1685–May 1686 |
| Walter Clarke[3] | May 1686–29 June 1686 |
| Henry Bull | 27 Feb. 1687–May 1690 |
| John Easton | May 1690–May 1695 |
| Caleb Carr[4] | May 1695–17 Dec. 1695 |
| Walter Clarke | Jan. 1696–March 1698 |
| Samuel Cranston[4] | March 1698–26 April 1727 |
| Joseph Jencks | May 1727–May 1732 |
| William Wanton[4] | May 1732–Dec. 1733 |
| John Wanton[4] | May 1734–5 July 1740 |
| Richard Ward | 15 July 1740–May 1743 |
| William Greene | May 1743–May 1745 |
| Gideon Wanton | May 1745–May 1746 |
| William Greene | May 1746–May 1747 |
| Gideon Wanton | May 1747–May 1748 |
| William Greene | May 1748–May 1755 |
| Stephen Hopkins | May 1755–May 1757 |
| William Greene[4] | May 1757–22 Feb. 1758 |
| Stephen Hopkins | 14 March 1758–May 1762 |
| Samuel Ward | May 1762–May 1763 |
| Stephen Hopkins | May 1763–May 1765 |
| Samuel Ward | May 1765–May 1767 |
| Stephen Hopkins | May 1767–May 1768 |
| Josias Lyndon | May 1768–May 1769 |
| Joseph Wanton | 1769–7 Nov. 1775. Deposed |
| Nicholas Cooke | Nov. 1775–May 1778 |
| William Greene | May 1778–1786 |
| John Collins | May 1786–1790 |
| Arthur Fenner, Federal-Republican | May 1790–15 Oct. 1805[5] |
| James Fenner, Federal-Republican | May 1807–1811 |
| William Jones, Federal-Republican | May 1811–1817 |
| Nehemiah R. Knight,[6] Federal-Republican | May 1817–9 Jan. 1821 |

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[1] William Coddington, of Newport, was elected, but the General Court would not engage him, for failing to clear himself of certain accusations.

[2] Died in office.

[3] The charter was suspended by Sir Edmund Andros till 1689. The deputy governor, John Coggeshall, acted as governor on the resumption of the charter, Governor Clarke refusing to serve.

[4] Died in office.

[5] Paul Mumford, governor, died in office. Henry Smith, first senator, officiated as governor. In 1806 no election of governor, Isaac Wilbour, lieutenant-governor, officiated.

[6] Elected United States senator, 9 Jan. 1821, for unexpired term of James Burrill, Jr., deceased.

| | | |
|---|---|---|
| William C. Gibbs[7] | Federal-Republican | May 1821–1824 |
| James Fenner | Whig | May 1824–1831 |
| Lemuel H. Arnold[7] | " | 1831–1833 |
| John Brown Francis | " | 1833–1838 |
| William Sprague[8] | " | 1838–1839 |
| Samuel Ward King. | " | 1840–1843 |

UNDER THE CONSTITUTION (ADOPTED IN 1842)

| | | |
|---|---|---|
| James Fenner | Whig | 1843–1845 |
| Charles Jackson | " | 1845–1846 |
| Byron Diman | " | 1846–1847 |
| Elisha Harris | " | 1847–1849 |
| Henry B. Anthony. | " | 1849–1851 |
| Philip Allen,[9] | Democratic-Free Soil | 1851–1853 |
| Francis M. Dimond (acting) | | 20 July 1853–1854 |
| William Warner Hoppin, | American, | 1854–1857 |
| Elisha Dyer | Republican | 1857–1859 |
| Thomas G. Turner. | " | 1859–1860 |
| William Sprague | " | 1860–3 Mar. 1863. Resig'd |
| William C. Cozzens[10] | " | 3 March 1863–May 1863 |
| James Y. Smith | " | 1863–1866 |
| Ambrose E. Burnside | " | 1866–1869 |
| Seth Padelford | " | 1869–1873 |
| Henry Howard | " | 1873–1875 |
| Henry Lippitt | " | 1875–1877 |
| Charles C. Van Zandt | " | 1877–1880 |
| Alfred H. Littlefield | " | 1880–1883 |
| Augustus O. Bourn. | " | 1883–1885 |
| George Peabody Wetmore | " | 1885–1887 |
| John W. Davis | Democrat | 1887–1888 |
| Royal C. Taft | Republican | 1888–1889 |
| Herbert W. Ladd | " | 1889–1890 |
| John W. Davis | Democrat | 1890–1891 |
| Herbert W. Ladd | Republican | 1891–1892 |
| D. Russell Brown | " | 1892–1895 |
| Charles Warren Lippitt | " | 1895–1897 |
| Elisha Dyer | " | 1897–1900 |
| William Gregory[11] | " | 1900–16 Dec. 1901 |
| Chas. Dean Kimball | " | 16 Dec. 1901–1903 |
| Lucius F. C. Garvin, | Democrat | 1903–1905 |
| George H. Utter | Republican | 1905–1907 |
| James H. Higgins | Democrat | 1907–1909 |
| Aram J. Pothier | Republican | 1909–1915 |
| R. L. Beeckman | " | 1915–1921 |
| E. J. San Souci | " | 1921–1923 |
| William S. Flynn | Democrat | 1923– |

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EDWARD FIELD,
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**RHODE ISLAND**, an island belonging to the State of Rhode Island, at the entrance to Narragansett Bay. It is separated from the mainland on the west by the estuary, Sakonnet River, and is the largest island in the bay. The State was named after this island. It is about 15 miles from north to south and three and one-half miles wide. It is divided into three townships: Newport, Portsmouth and Middletown. It is a famous summer resort. Newport (q.v.), the city, is on the southwest coast.

**RHODE ISLAND, Battle of,** an engagement which occurred 29 Aug. 1778. The British had seized Newport and garrisoned it with 6,000 men under Pigott. An attack was concerted by Sullivan and Lafayette on land and Count d'Estaing on sea. Sullivan seized Butts' Hill on the island of Rhode Island. Estaing was obliged to meet Howe and the English fleet, but battle was prevented by a fierce storm, and Estaing withdrew to Boston to refit. Pigott attempted (29 August) to carry Butts' Hill, and a bloody repulse of the British resulted; but on the arrival of Clinton with 5,000 reinforcements the Americans were compelled to evacuate the position.

**RHODES**, rōdz, **Cecil John**, South African financier and statesman: b. Bishop's Stortford, Hertfordshire, England, 5 July 1853; d. Cape Town, 26 March 1902. He was educated at the grammar school of his native town, but before he could pass on to the university a serious affection of the lungs necessitated his departure for Natal, where an elder brother of his was engaged in cotton-raising. Rhodes landed in South Africa in 1870 and after a brief experience in farming made his way to the diamond fields of Kimberley, where he met with speedy and astonishing success. At 19 he was a millionaire and, with his health well recovered in the salubrious air of the veldt, he planned to return to England to resume his interrupted education. Before leaving South Africa he traveled for eight months, by ox-cart and on foot, through the region north of the Orange and the Vaal, and his imagination, which even at that early age worked in vast spaces, saw in the fertile, thinly populated country virgin soil for the building up of an imperial Britain in the Dark Continent. He matriculated at Baliol College, Oxford, in 1873, but his ailments returned and he was compelled to leave England in the same year. Three years in South Africa made him robust again and from 1876 on he kept his terms at the university, spending the long vacations in South Africa, and taking his B.A. and M.A. in 1881. In the same year Rhodes entered the Cape Parliament as member for Barkly West. By this time his plans for the future had assumed a definite character. Convinced, at all times, of the supreme fitness of the English race for the task of governing the world, Rhodes made it his object in life to further the realization of that end in his own especial sphere of South Africa. To aid him in his schemes he looked to money, in whose power he had a tremendous faith, and it is because of the close connection in him of the selfish money-getting instinct and the broad ambition of the statesman that Rhodes remained for many years an enigma to the world. In the Cape Parliament Rhodes devoted himself to the task of establishing harmonious relations between the English inhabitants and the Dutch, for with true insight he recognized that if British influence was to dominate South Africa it must be conditioned by the goodwill of the people of Dutch blood. The first step in his scheme of imperial expansion was the acquisition of Bechuanaland as a British protectorate in 1884. For this he labored against the indifference of the home government, which he finally stirred to action by his insistence upon the necessity of securing Bechuanaland as an outlet for the British trade to the north, already threatened by the encroachments of the Transvaal from the east and Germany from the west.

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[7] In 1832, no election of governor, lieutenant-governor, or senators. Elections were successively ordered for 16 May, 18 July, 28 Aug. and 21 Nov. 1832, resulting without choice. At the January session, 1833, the officers who had not been re-elected in 1832 were continued in office until the next session.

[8] In 1839, no election of governor or lieutenant-governor. Samuel Ward King was first senator and acting governor.

[9] Resigned 20 July 1853, having been elected United States senator, May 1853. Francis M. Dimond, lieutenant-governor, officiated.

[10] Governor Sprague resigned 3 March 1863, to accept the office of United States senator; and Lieutenant-Governor Arnold having been previously elected to the Senate of the United States to fill the vacancy caused by the resignation of James F. Simmons, Mr. Cozzens became governor by virtue of his office as president of the State senate.

[11] William Gregory was re-elected governor 5 Nov. 1901, but died 16 Dec. 1901, and Lieutenant-Governor Kimball became governor.

The annexation of Bechuanaland was a victory for Rhodes over Kruger, the astute President of the Transvaal, but the struggle between the two did not end there. When Boer commanders began to cross the Limpopo River, the northern boundary of the Transvaal, about 1887, Rhodes, to cut off their advance in that direction, obtained from Lobengula, king of the Matabele who were masters of the country between the Limpopo and the Zambesi, the exclusive right to search for minerals within his territories, and in 1889 the British South Africa Company was incorporated with almost absolute political and territorial powers over a vast, indefinite tract north of the Limpopo. In 1890 settlers were brought into the country and founded Fort Salisbury in Mashonaland, and at the same time the construction of a railway was begun which, running entirely through British territory, was to connect the new settlements with the Cape. Reading his title to Rhodesia, as the country was soon called, in liberal terms Rhodes (after 1893) extended the operations of the company north of the Zambesi as far as to the southern end of Lake Tanganyika, and though his dreams of an «all red» map of Africa had been dissipated by the convention of 1889 with Germany, which allowed that country to stretch a barrier across the continent to the Kongo State, he did not abandon his scheme of a transcontinental telegraph line from north to south and a railway «from Cape to Cairo.» Upon his political projects Rhodes spent vast amounts of money, partly his own, partly the funds of the De Beers Consolidated Mines, a corporation formed by him in 1888 and controlling the entire diamond output of the famous Kimberley mines. Of this company he was managing director.

In 1890 Rhodes became Premier of Cape Colony. During his six years of office he gave special attention to his old policy of amalgamation between Dutch and British; he succeeded in winning the confidence of the former by his strong advocacy of full local government for Cape Colony, which he considered quite consistent with, and indeed, essential for, the scheme of imperial federation. It is this belief in a federal union of locally autonomous commonwealths that explains his gift of £10,000 to the funds of the Irish Home Rule party in 1888. In his treatment of the native races of Cape Colony, Rhodes maintained the impossibility of granting them equal rights with the white population, but at the same time held it necessary to protect them by law against the temptations of civilization and exploitation by the whites. In Rhodesia a formidable outbreak of the Matabele in 1893 ended, after a bitter conflict, in their utter defeat and the absorption of their territory by the Chartered Company. Successful everywhere, however, Rhodes was destined to fall before his old opponent, Kruger, of the Transvaal. The Jameson raid in 1895 destroyed Rhodes' personal power, although subsequent events fully vindicated his policy. Though the full truth of the Jameson affair may not perhaps be known, it is established that Rhodes, who was a large holder of mines in the Rand, plotted with other leaders of the Uitlanders in Johannesburg for the subversion of the Transvaal government; that a revolution was prepared in Johannesburg, and that Rhodes stationed Captain Jameson with several hundred men of the Rhodesian mounted police on the western border of the Transvaal to co-operate when necessary with the leaders in the mining town; and though it is also established that Jameson invaded the Transvaal without Rhodes' orders, the results of that unhappy affair were not altogether unjustly reckoned up against the Premier of Cape Colony who abused the powers of his office to plot the downfall of a nation, when conservative methods interfered with his dominating ideas for imperial advancement (see JAMESON, LEANDER STARR). A committee of the House of Commons acquitted Rhodes of responsibility for the raid, but censured his conduct as Minister and director of the Chartered Company. Rhodes resigned the premiership on the last day of 1895 and thenceforth devoted himself to the interests of Rhodesia. A second war with the Matabele in 1896 was terminated by Rhodes' intrepid courage; the building of the trans-continental railway was rapidly pushed forward, and in connection with this undertaking Rhodes visited Europe in 1898–1900, carrying on negotiations with Mr. Chamberlain, the Colonial Secretary, and with the German emperor. During the Boer War, in its outcome the triumph and realization of his policy, Rhodes was besieged in Kimberley and took part in its defense. His health, however, gave way, and in spite of a trip to Egypt, his old disease finally conquered. In his lifetime Rhodes was the subject of infinite execration, as well as unlimited applause. Looked upon by different men as a statesman or a land grabber, a builder of empires or an unscrupulous speculator, he was all of these and more; and the anomaly of his character may, perhaps, be best explained if he be regarded as a man of great aims who let nothing stand in the way of their achievement. He bequeathed the bulk of his great fortune for the endowment of a large number of scholarships at Oxford University, with the intention to bring about the complete union of the English speaking races for the peace, enlightenment and uplift of humankind (see RHODES SCHOLARSHIPS, THE). Consult Fuller, G. E., ‘Cecil John Rhodes’ (New York 1910); Hensman, H., ‘Cecil Rhodes: A Study of a Career’ (Edinburgh 1901); Jourdan, P., ‘Cecil Rhodes: His Private Life’ (New York 1911); Le Sueur, H., ‘Life of Cecil Rhodes’ (New York 1913); Michell, L., ‘The Life and Times of the Right Honourable Cecil John Rhodes’ (2 vols., New York 1910); Radziwill, Princess Catherine, ‘Cecil Rhodes: Man and Empire Maker’ (New York 1918); Stead, W. T., ‘Cecil Rhodes’ (in *Review of Reviews,* London, May 1902); «Vindex,» ‘Cecil Rhodes: His Political Life and Speeches’ (London 1900).

**RHODES, James Ford,** American historian: b. Cleveland, Ohio, 1 May 1848. He studied at the University of the City of New York and also at Chicago University, his courses being principally confined to history, literature, rhetoric and metaphysics. In 1867 he went to Paris and attended lectures at the Collège de France following which he pursued a course in metallurgy at the School of Mines in Berlin, and made a tour of inspection through the iron and steel works of Germany and Great Britain. He was Paris correspondent of the Chicago *Times.* In 1870 he entered his father's iron business in Cleveland and became a member of the firm in 1874. Having acquired sufficient wealth to enable him to adopt a literary career, he retired from business in 1885, and began the preparation of his ‘History of the United States from the Compromise of 1850.’ In 1891 he took up his residence at Cambridge, Mass., and the next year the first two volumes of his work were published. It was completed in 1906 with the publication of the seventh volume. It is the most authoritative work on the period with which it deals; is impartial; fair to all; but lacks literary grace. The Loubat prize was awarded him by the Berlin Academy of Sciences in 1901. Mr. Rhodes is also the author of ‘Historical Essays’ (1909); ‘Lectures on the American Civil War,’ delivered at Oxford University (1913) and ‘History of the Civil War’ (1917). He was awarded the gold medal of the National Institute of Arts and Letters in 1910 and is an ex-president of the American Historical Association.

**RHODES,** an island of Italy, in the Ægean Sea, near the southwest coast of Asia Minor, from which it is distant about 11 miles. It lies between lat. 35° 52′ and 36° 28′ N., and long. 27° 40′ and 28° 15′ E., is about 45 miles long and 25 miles broad, and has an area of about 424 square miles. The island is crossed from north to south by a high mountain range which attains its extreme elevation in the peak of Atairo, the ancient Atabyron, with an altitude of 4,070 feet. Hills of a lower level traverse the island in all directions and are covered with coniferous trees, the considerable remnants of once splendid forests. Along the many mountain streams tropic plants grow in abundance, chief among them myrtles, oleanders and cactus. The soil is fertile and on the hillsides and in the valleys and plains, vines and olives, figs, pomegranates and oranges are grown. Wheat of an excellent quality is also raised, but not in sufficient quantities to form a commodity of export. Rhodes has been famous since ancient times for the mildness of its climate and its salubrious air. The winds show little variation. The value of the foreign commerce is about $1,000,000, the chief articles of export being sponges, oil and fruit, and the chief imports cotton goods and textiles. There is regular communication by English, French and Austrian steamship lines. The island formed a *sanjak* or district of the Turkish province of the Isles of the White Sea, and its capital, Rhodes (q.v.), was the seat of a pasha. The population is placed at 30,000, of whom two-thirds are Greeks, about 7,000 Mohammedans and 2,500 Jews.

The original inhabitants of Rhodes are unknown, but at the dawn of history the island was inhabited by a mixture of races from Asia Minor, and Phœnicians, the latter of whom seem to have come from Crete. In the earliest period of Hellenic migrations Rhodes was overrun by the Dorians who founded the cities of Lindus, Ialysus and Kamyrus, the sites of which may still be identified. These cities with the three Dorian cities on the mainland, Cos, Cnidus and Halicarnassus, constituted the so-called Dorian Hexapolis whose common shrine was the temple of Apollo Triopis on the Carian coast. The sun-god was at all times the favorite deity of the island and from one of his most common emblems, the rose, its name (*rhodos* in Greek, «rose») is said to be derived. The Rhodians were among the most enterprising traders in the Mediterranean and their colonies were found in Spain, in southern Italy and Sicily, and on the southern coast of Asia Minor. In 408 B.C. the inhabitants of the three ancient towns abandoned their homes and joined to form the new city of Rhodes (q.v.) which from now on was the capital of the island. The foundation of Rhodes exercised a tremendous influence on the development of the trade of the island. In the Peloponnesian War, Rhodes sided with Athens until 412 B.C., when it went over to Sparta. In 394 B.C., however, it returned to the Athenian allegiance. Occupied by the Macedonians during Alexander the Great's lifetime, it revolted after his death and defended its independence with splendid success against Demetrius Poliorcetes in 304 B.C. The island was now at the very height of its power; its commerce attained an unprecedented development and by means of its strong navy it made itself master of a strip of territory on the Asiatic mainland. The Athenian orator Æschines (q.v.) established a noted school of oratory in the city of Rhodes, which also became a great centre for the arts, especially sculpture, and one of the leading university towns of the Roman world. Early in the 2d century B.C. Rhodes became an ally of Rome and enjoyed its favors. In 42 B.C. it was plundered by Cassius because it sided with Julius Cæsar, and in 44 A.D. it was united to the province of Asia. In 661 the island was taken by the Arabs, but was recovered by the Byzantines who in 1310 gave it over to the Knights of Saint John. The latter held it against the Turks until 1522, when it was taken by Solyman II, and has since remained under Turkish domination. The island is subject to earthquakes, in modern times those of 1851 and 1856 being especially disastrous.

**RHODES, or KASTRO,** a town and the capital of the island of the same name, situated at its northeastern extremity. The modern town is of much smaller extent than the ancient city, but is still of imposing appearance. It is built in the form of an amphitheatre and is surrounded by walls and a ditch dating from the time of its occupation by the Knights of Saint John, the memorials of whom constitute the most interesting features of the town. Among these are the hospital, the palace of the grandmaster and the cathedral of Saint John, the latter two in a ruinous condition. The streets are tortuous, the most picturesque being the Knights' street, which has preserved its mediæval appearance. The town has three ports, the one to the north, the central and the southeast port; of these the central port is the only one practicable, but is in part choked up with sand. Near the harbor in ancient times stood the famous Colossus (q.v.). The population is about 11,500, mostly Turks and Jews.

**RHODES, Colossus of.** See Colossus.

**RHODES, Law of,** a code of maritime laws adopted by the people of Rhodes (q.v.) about 900 B.C., after their naval victories and their practical sovereignty of the sea. A later collection, known as «Rhodian Sea-Law,» is generally believed not to have been the original maritime code of Rhodes and to have been put together some 1500 to 1700 years later, or from 600 to 800 A.D., by some private individual. The maritime law of Rhodes is of very considerable importance because of the fact that the Romans borrowed much from it in the compilation of their own maritime laws and in their observances of the rules governing the sea. It has, therefore, indirectly influenced modern maritime law. See Maritime Law.

**RHODES-GRASS,** a newly-introduced species, is a native of central and southern Africa, where it is regarded as one of the best species for pastures on dry soils. It is a perennial, growing from three to four feet high, with a large number of very long, narrow and tender leaves and with rather few branching stems.

When grown from seeds its growth is commonly erect the first season, but when grown from roots, or the second season when grown from seed, it makes runnerlike branches two to four feet long, which root at the joints and so cover the ground quite rapidly.

It is propagated by both seed and roots. When seed is used it should be sown at corn-planting time at the rate of about 10 pounds per acre on a soil having a fine mellow surface and then given a light harrowing. As the seed is produced only in small quantities and as it continues to be developed and matured through the entire season, little of it can be gathered at any one time; consequently the grass is more commonly propagated by roots. The roots may be planted in well-prepared land at any time from February to July, putting them two to four feet apart and protecting them from grazing until they become well established. This grass has been introduced so recently that seed is still scarce on the market.

While the principal value of the grass is for grazing it is also used for hay, giving two or three cuttings of about one ton each per acre. The hay is of excellent quality. It bears severe drought and moderate frost without injury, but is easily killed by plowing late in the season. It is not recommended for cultivation except in the southern part of the Gulf States. Rhodes-grass is especially promising for the semi-arid regions of the extreme Southwest, where the temperature does not fall below 20° F.

**RHODES SCHOLARSHIPS, The.** The system of scholarships founded by the will of Cecil John Rhodes (q.v.), which provided in perpetuity for the support at Oxford University, for a term of three years each, of about 176 selected scholars from the British colonies, the United States and Germany. The scholarships were apportioned as follows: Rhodesia, 9; Cape Colony, 12; Natal, 3; Australia, 18; New Zealand, 3; Canada, 6; Newfoundland, 3; Bermuda, 3; United States, 2 for each State and Territory; total, 104; Germany, 15. The scholarships have an annual value of £300 ($1,500) and are intended to bring about complete unity of the English-speaking race. The German scholarships of £250 ($1,250) were added as ex-Kaiser Wilhelm II had «made instruction in English, compulsory in German schools.» Owing to Germany's action in the European War, an act was passed in 1916 canceling the German scholarships and allotting them to Alberta, Saskatchewan, the Transvaal, the Orange Free State and to the towns of Kimberley and Port Elizabeth, alternately. Appointments to Rhodes scholarships were postponed during the war and were resumed in 1919.

As already stated the Rhodes will provides for two scholarships constantly at Oxford from each State in the Union. Each scholar stays three years and receives a stipend of $1,500 a year, out of which he pays his tuition, fees and expenses, exactly as any other student. There are no restrictions as to the subjects which he should study; Rhodes scholars may take any of the various Oxford Honor Schools or, if prepared, may work for the Oxford research degree of B.Litt., B.Sc., B.C.L. or Ph.D. Candidates must be unmarried, between the ages of 19 and 25 and must have completed at least their second year in college. Candidates may try for the appointment either from the State in which they reside or from that in which they have received the major part of their education. The qualifying examination which was required of all candidates for Rhodes scholarships in the past has been abandoned and it is only necessary for candidates to make formal application, endorsed by the authorities of their college or university. The selections are made on the basis of a man's record in school and college, according to the four points outlined in the Rhodes will: (1) Scholarship, (2) character, (3) interest in outdoor sports and (4) interest in one's fellows and instincts for leaderships.

The selections are made by committees in each State constituted for that purpose.

**RHODESIA,** rō-dē'zĭ-ą, South Africa, a British possession colonized in the last quarter of the 19th century by the British South African Company, founded by Cecil John Rhodes (q.v.), after whom it is named. It is bounded on the north and northwest by the Kongo Free State, on the west by Portuguese territory and Bechuanaland, on the south by Bechuanaland and the Transvaal, on the east by Portuguese territory and the British Central Africa Protectorate and on the northeast by German East

Africa. Total area, about 750,000 square miles. The river Zambesi, which traverses it from west to east, divides it into the two portions called Southern and Northern Rhodesia. Southern Rhodesia (area, 174,728 square miles) consists of the two former districts of Mashonaland, capital, Salisbury, and Matabeleland, capital, Buluwayo. Northern Rhodesia is divided into two parts under separate administrators, namely, Northeastern Rhodesia, headquarters, Fort Jameson, and Northwestern Rhodesia, headquarters, Lialui.

The river Limpopo forms the southern boundary and the Matoppo Hills and their northeastern continuations from the watershed between the basins of the Zambesi and the Limpopo. Of the tributaries flowing north to the Zambesi, the most important are the Shanghani, Umfuli and Panyame; and of those flowing south to the Limpopo the Bubye, Tuli, Shashi and Macloutsie. The whole country is a plateau varying in elevation from 3,500 to 5,000 feet above sea-level, and in Southern Rhodesia there are numerous mountain ranges, of which the chief is that of the Matoppo Hills already mentioned, Rhodes' burial-place. Of the individual peaks Mount Hampden near Salisbury, Hartley Hill, Mount Wedza near New Umtali and Mount Inyanga are the best known. There appear to be no lakes of any importance apart from the great lakes on the frontiers of Northern Rhodesia (Tanganyika, Moero, etc.). The prevailing rock-formations are granite and metamorphic rocks, and rounded, projecting knobs of granite, often of fantastic appearance, form a striking feature in the scenery of many districts. The climate in the higher parts of the country is generally suitable for Europeans, but in the lower swampy parts and some of the river valleys malaria is prevalent, and the tsetse fly commits great ravages among cattle and horses. The area above 3,000 feet in Southern Rhodesia, most of which is adapted for the residence of Europeans, is stated at 100,000 square miles, and above 4,000 feet, where European children can be reared, there are 26,000 square miles. The summer season, from December to April, is characterized by great heat during the day and heavy rains, but during the rest of the year the weather is generally dry and much colder, especially in June and July. At Salisbury the mean July temperature is 57.5° F., the mean January temperature 70.5° F., and the extremes for the year are about 34° and 93°. The annual rainfall is about 33.8 inches and falls on some 75 days. The soil in many parts is fertile, and the ordinary cereals, vegetables and fruit-trees of Europe can be grown, in addition to the native crops of rice, tobacco, india-rubber and cotton. Extensive tracts of land furnish excellent pasture. Gold has been worked in Southern Rhodesia from ancient times, and there are striking remains at Zimbabye (near Victoria) and elsewhere, of the works erected by the early miners. At the present time little, if any, alluvial gold is found, but quartz-reefs are being worked with more or less success in various parts of the country, especially around Gwanda, Buluwayo, Gwelo, Sebakwe, Victoria, Umtali, Mazoe, Salisbury, Hartley Hill, Lo Magonda, Abercorn and Selukwe. The total output of gold for the year 1900–01 was 106,783 ounces, valued at $1,919,900. Coal, iron, copper, silver, tin, plumbago and kieselguhr have also been reported, and some of them are being worked. Southern Rhodesia is being rapidly opened up by means of railways, telegraphs and roads. Buluwayo is in direct railway communication with Cape Town, 1,360 miles, and in 1899 the line from Salisbury to the Portuguese coast at Beira was opened for traffic. A line to connect Salisbury with Buluwayo is rapidly approaching completion and other subordinate lines have been projected or begun.

The whole of Rhodesia, together with the treeless plain of Barotseland on the northwest, was until 1922 under the administration of the British South Africa Company, which was incorporated by royal charter in 1889. Southern Rhodesia, however, was more directly under the control of the imperial government. The administration was carried on in accordance with the company's charter as amended by order in council of 1894 and 1898. The senior administrator, with headquarters at Salisbury, had an administrative council of six members and a legislative council of 10 members, the latter including two elected representatives of each of the two great divisions of the province. The enactments of these councils were subject to the approval of the high commissioner for South Africa, who acted through a resident commissioner. Jury trial was introduced in 1899. There are resident magistrates and judges, from whom an appeal lies to the Supreme Court of Cape Colony and thence to the Judicial Committee of the Privy Council. In 1922 Rhodesia became a self-governing Dominion within the British Empire. The constitutional status was decided by popular referendum, alternative proposals being a system of responsible government or the entry into the Union of South Africa. The former proposal received a majority of 2,785. The revenue in 1921–22 was £1,387,000 and the expenditure £1,315,000. The total native population of Southern Rhodesia is estimated at 770,000. The white population is about 33,620.

The chief tribe of original native inhabitants is that of the Mashonas, a peaceful and industrious race. In 1836 a Zulu people, known as Matabele, invaded the country under a chief called Mosilikatse, and easily conquered the indigenous inhabitants. For more than 50 years this warlike race held undisputed sway in Southern Rhodesia, and appear to have grievously oppressed the subject peoples, but in 1890 an expeditionary force equipped by the British South Africa Company occupied Mashonaland without opposition and founded the town of Salisbury. The Matabeles were for a time left undisturbed, but in 1893 their raids into Mashonaland gave the company an opportunity of extending its authority. Three columns, one of them assisted by subjects of Khama, chief of the Bamangwato, advanced from the northeast, the east and the southwest, respectively, upon Buluwayo, the capital of Lobengula, who had succeeded his father, Mosilikatse, as chief of the tribe. The Matabeles were easily overcome by means of the Maxim machine-guns, and fled to the hills. Toward the end of 1893 Lobengula sent overtures for peace, together with a sum of money, but the fatal cupidity of some men of the Bechuanaland police prevented these from reaching the company's officials. Accordingly the Matabeles who remained around the person of their chief, enraged by the supposed rejection of their overtures, surrounded a small party of Englishmen under Major Wilson, who, unable to escape, fought desperately till all were killed. Lobengula died early in 1894 and all resistance was at an end. Matabeleland has since formed a part of the company's dominion, but a serious native revolt, partly due to the ravages of rinderpest and locusts, broke out in 1896. Mashonaland also revolted about the same time, but both rebellions were peaceably settled by Cecil Rhodes' personal influence over the natives. Consult Bent, J. T., 'The Ruined Cities of Mashonaland' (London 1893); Darter, A., 'The Pioneers of Mashonaland' (London 1914); Fyfe, H. H., 'South Africa To-Day, with an Account of Modern Rhodesia' (London 1911); Hall, R. N., and Neal, W. G., 'The Ancient Ruins of Rhodesia' (London 1902); Heatley, J. T. P., 'Development of Rhodesia and its Railway System in Relation to Oceanic Highways' (Washington 1907); Hensmann, H., 'History of Rhodesia' (London 1900); Hone, P. F., 'Southern Rhodesia' (London 1909); Johnson, T. P., 'The Mineral Industry of Rhodesia' (London 1911); Knight, 'Rhodesia of To-Day' (1901); Laing, D. T., 'The Matabele Rebellion, 1896' (London 1897); Leonard, 'How we made Rhodesia' (1896); MacIver, D. R., 'Medieval Rhodesia' (London 1906); Rrolin, H., 'Les loiset l'administration de la Rhodesie' (Brussels and Paris 1913); Selous, F. C., 'Sunshine and Storm in Rhodesia' (London 1896); Thomson, H. C., 'Rhodesia and its Government' (London 1898); Toit, S. J. du, 'Rhodesia, Past and Present' (London 1897).

**RHODIAN LAW,** an early system of marine law, said to have been compiled by the Rhodians after they had obtained the sovereignty of the sea. The only rule that we know now, though the entire code was adopted by the Romans under Antonius Pius, is the principle of general average: «If a cargo be jettisoned to lighten the ship, all contribute to make good the loss incurred for the benefit of all.» The mediæval naval law of the Rhodians was not of Rhodian origin. It consisted of four distinct parts, of very different dates, but mostly of practical value.

**RHODIUM,** a metal belonging to the platinum group, discovered by Wollaston in 1804. It occurs in small quantities in various platinum ores; is a grayish-white metal; is very hard and infusible, scarcely softening in the flame of the oxyhydrogen blowpipe; and is unaltered in the air at ordinary temperatures, but oxidizes at a red heat. Insoluble in acids, it is readily oxidized by fusion with nitre. The specific gravity of fused rhodium is 12.1; its atomic weight is 103. The compounds of this metal have not been much studied.

**RHODOCHROSITE, or DIALOGITE,** native manganese carbonate. It is usually either cleavable-massive or in rhombohedral crystals of rose-pink or brownish-red color. Its lustre is vitreous to pearly; hardness, 3.5 to 4.5; rhombohedral, cleavage highly perfect. Its most important localities are in Hungary, Germany and Colorado, in which State many magnificent specimens have been found.

**RHODODENDRON,** a genus of shrubs and trees of the family *Ericaceæ*. About 200 species have been recognized, natives mainly of the cooler parts of the northern hemisphere. They are most numerous in eastern Asia; seven are indigenous to America. They are usually evergreen, have smooth simple leaves and terminal umbel-like racemes of generally very showy flowers for which the plants are widely popular as ornamentals. A few species yield wood which is used in turning and cabinet work, but more largely as fuel; the flowers of others are used in jelly-making, and the leaves of a few have been used medicinally. They are sometimes made to include azalea (q.v.) by some botanists, but are usually considered distinct, the azaleas being generally deciduous. Some species are only a few inches tall, others exceed 50 feet in height, with trunks 18 inches in diameter.

Rhododendrons are readily propagated by seeds, cuttings or layers usually under glass; but choice varieties are most frequently grafted upon seedling stocks. The seeds are very small and are generally sown in seed-pans during early spring in peaty, sandy soil. The seedlings are pricked off as soon as possible; the greenhouse kinds under glass, the hardy ones in cold frames until the following year, when they may be grown in nursery rows. When planted in the garden they should always be protected from heavy wind and the full glare of the sun. The deep shade afforded by walls and hedges is, however, not generally desirable. They do not succeed well as a rule upon limestone, limy or clayey soils, but thrive best upon well-drained, though moist loamy soils underlaid by porous subsoil. Since the roots lie close to the surface no cultivation can be given, but mulching may take its place. Pine needles and marsh or salt hay are specially desirable since they are free from weed seeds. Annual or biennial dressings of well-rotted stable manure should be given. The seed vessels should be cut off when the flowers have fallen, to divert the plant food into new flower buds and to prevent the scattering of seed. The greenhouse kinds require very porous peaty soil, free watering during the summer, careful watering in winter, cold but not frigid quarters for the Himalayan species, and not less than 50° for the Javanese kinds which bloom and grow continuously and require more water also. These last also being epiphytes require still more open soil. They are exceptionally attractive when properly grown.

Among the American species the great laurel (*R. maximum*) is the largest, attaining a height of 30 feet or more. It is indigenous from Nova Scotia to Michigan and southward in the mountains to Georgia. In early summer when its rose or lilac flowers appear in profusion it is an imposing subject and is justly popular as a park specimen. If taken when small from loose soil in the woods it usually transplants well, but nursery-grown plants should be given preference. Though called *maximum,* several of the Asiatic species discovered since this was named are far larger. *R. catawbiense,* a species with lilac-purple flowers often one and one-half inches in diameter, is one of the most beautiful of ornamental shrubs. It rarely exceeds 15 feet. In the mountains from Virginia to Georgia it is very common but in cultivation is well known as hardy in New England.

It is one of the parents of a host of hybrid varieties of remarkable beauty.

*R. ponticum,* a native of western Asia and the Iberian Peninsula, resembles *R. maximum* but rarely exceeds 10 feet in height. It is considered less hardy than the preceding species, but is widely cultivated, especially in Europe. Several remarkably striking species were discovered by Hooker and other botanists in southern Asia, those of the Khasia Hills being especially noted. Only a few of these, however, have been introduced into cultivation and still fewer have been brought to America. Some have flowers four inches in diameter, others perfumed blossoms and some are epiphytic in their habits. Consult Bailey, ‹Standard Cyclopedia of Horticulture.›

**RHODOLITE,** a beautiful light red variety of garnet, found only in North Carolina, highly prized as a gem, for which it has been extensively worked and sold within a few years past. The name is from the Greek *rhodon,* a rose, the color resembling some roses and rhododendrons, and, unlike most garnets, becoming extremely brilliant by artificial light. Analysis shows that rhodolite is composed of two molecules of pyrope garnet with one of almandite garnet. It occurs intimately associated with the Cowee rubies (see RUBY) of Macon County, the crystals of the latter sometimes even enclosing the rhodolite. It is one of the most important gem-stones of North Carolina.

**RHODONITE,** a rose-pink or brownish-red triclinic mineral, essentially a manganese meta-silicate, $MnSiO_3$. It usually contains some calcium and iron, while zinc is present in the variety fowlerite, which occurs at Franklin Furnace and Ogdensburg, N. Y., in groups of magnificent crystals several inches in length. Sweden yields attractive specimens and masses of much beauty associated with braunite are found at Cummington, Mass. Its most important occurrence is near Ekaterinburg, in the Ural Mountains, from which locality the Russians have for many years mined considerable quantities as an ornamental and semi-precious stone, for which purposes it is highly esteemed, being cut into pillars, mantels, table tops, jewel caskets, etc. Its hardness varies from 5.5 to 6.5. Crystallized specimens show an eminent cleavage; the massive forms are exceedingly tough, like jade.

**RHODOPE,** rŏd'ō-pē, ancient name of a mountain chain (7,474 feet) extending along the borders of Macedonia and Thrace. The Turks call it Dospad Yailasi, the Bulgarians Despoto Dagh, both titles having reference to the numerous (Greek) monasteries that stud its sides. Of these the most famous is the vast fortress-monastery of Rilo, in the northwest of the range, standing on its south side in the midst of magnificent pine forests. Rilo has for generations been the focus of the national Bulgarian Church and the mainstay of Bulgarian nationality.

**RHONDDA,** rŏnd'ạ, **David Alfred Thomas,** VISCOUNT, British coal magnate and food controller: b. Aberdare, Wales, 26 March 1856; d. Llanwern Park, Wales, 3 July 1918. He was educated at Caius College, Cambridge, and was a scholar of Jesus and Caius colleges. He entered the colliery firm in which his father held a large interest, and at the time of his death was senior member of the firm of Thomas and Davey. In 1916 he effected a great combination of the coal-mining interests known as the Cambrian mines, in which he was a controlling director. His reputation was that of a hard, resourceful fighter, whose sympathies were with the people. He served as president of the Cardiff Chamber of Commerce in 1895 and from 1893 to 1897 was president of the South Wales Liberal Federation. From 1888 to 1910 he represented Merthyr Burghs in the House of Commons, and in 1910 represented Cardiff. In 1916–17 he was president of the local government board. His most conspicuous service to his country was as food controller, to which position he was appointed in 1917. The appointment became effective in June of that year. At once, under the power given him by the Defense of the Realm Act, he took over the wheat, potato, barley, oats and rye crops. He announced that the solution of Great Britain's food supply was in America, and he set out to obtain the co-operation of the United States. In the winter of 1917, when the expected American supplies of wheat and meat did not arrive, it was Lord Rhondda's careful handling of the food distribution that saved England from extreme hardship. He put an effectual stop to profiteering and speculation in food. In January 1918 the rationing system was put into effect. Customers were required in every community to register, to buy only at one store and to buy at no store where they could not be accommodated quickly. Drastic restrictions were put on the use of wheat and grains. Lord Rhondda's greatest source of satisfaction in his work was the fact that the German government had directed its newspapers to be silent about the food supply in England. His resignation from the post of food controller was first made in February 1918 when his health failed. He continued *in absentia* at the Premier's request and was officially in office when he died. In 1916 he was created first baron of Llanwern and on 3 June 1918 was made viscount in recognition of his delivery of England from a food crisis.

**RHONDDA,** a river and town of South Wales, in Glamorganshire. Its valley is the seat of a large population engaged in coal-mining and metallurgical industries. The inhabitants are employed mainly in collieries, iron-works, etc.

**RHONE,** rōn, a river of Europe which rises in Switzerland, near the east frontiers of the canton of Valais. Its precise origin is commonly said to be in the Rhone glacier, between Mount Furca on the east, the Gallenstock on the north and the Grimsel on the west, 5,581 feet above the level of the sea; but the natives give the name of Rhodan or Rotten to three springs situated in a single basin at the foot of the Mayenwand, at an elevation of 5,282 feet, the water of which flows with an equal temperature in summer and winter (61° to 63° F.), and these they consider to form the true source of the Rhone. The waters from these springs join the stream from the glacier at a very short distance from their origin. The young river dashes down with great rapidity into the valley beneath, leaping from cascade to cascade; traverses the centre of Valais in a westerly direction, and near Villeneuve enters the Lake of Geneva at its eastern extremity. On entering the lake its waters are surcharged with mud; but on issuing from it, at its southwest extremity, at the town of Geneva, it is of a pure deep blue color, soon after changed into a muddy brown by the accession of the glacier-born Arve, which joins it one and one-half miles below Geneva. Proceeding southwest to the frontiers of the department of Ain in France, it turns almost due south, forming the boundary between that department and Savoy; then turning suddenly northwest, traces the boundary between the same department and that of Isère and reaches Lyons. Here, having at least doubled its volume by the accession of the Saone, it proceeds almost due south, separating the departments of Rhone, Loire, Ardèche and Gard on the west, from the department of Isère, Drôme and Vaucluse on the east. On approaching Avignan it takes a more circuitous but still southerly course, separates the department of Gard from that of Bouches-du-Rhône, traverses part of latter department and finally falls into the Gulf of Lyons in the Mediterranean. At Arles it divides into two branches, the lesser of which, under the name of old Rhone, flows southwest, forming the west side of the large delta, known by the name of the Ile de Camargue. The main branch, under the name of Grand Rhone, continues its southerly course, but again divides into two branches and enters the sea by two mouths. Its whole course is about 580 miles, of which 200 miles are in Switzerland and 380 miles in France. It is navigable for 360 miles. By means of a series of magnificent canals, the navigation of the Rhone has been continued, without interruption, to the Rhine (through the Saone), Seine, Loire and Garonne.

**RHOPALACERÆ,** butterflies (q.v.); see also Lepidoptera.

**RHUBARB, WINE PLANT,** or **PIE PLANT,** several species of perennial herbs of the genus *Rheum,* family *Polygonaceæ.* They are natives of Asia and eastern Europe and have generally very large radical leaves with thick fleshy petioles and small greenish or whitish flowers in racemes or paniculate fascicles which are borne on stout stalks well above the foliage. Several of the species are valued for bold effects in ornamental gardening, and some have been used in medicine, but the most important species is the common rhubarb (*R. rhaponticum*) which has long been cultivated in gardens for its tender, acid, esculent leaf-stalks, which are largely used for making pies, sauce and preserves in spring, and to a less extent for home-made wine from the juice. The plants are usually propagated by means of divided roots, though seed is also used. They thrive best in rich, light, friable loamy soils, well drained but moist, and given liberal applications of manure of all kinds. The plants should be set not less than three feet apart each way, given clean cultivation until the foliage shades the ground and mulched with stable manure during the winter. When two years old the stalks may be used freely. They are most easily gathered by bending them down while being pulled. The earliest stalks are obtained by inverting a barrel over the plants and heaping manure around it; but for forcing the roots are dug in autumn, allowed to freeze, covered with earth or sand in cellars, under greenhouse benches, etc., and watered. After producing a crop the roots are thrown away. Large quantities are cultivated in the Southern truck gardens, but the forced stalks are considered superior and generally command higher prices.

Turkey rhubarb, formerly popularly used in medicine is supposed to be derived from *R. palmatum,* but the exact species seems to be still undetermined. Chinese Tartary and parts of China were the principal shipping countries, but Asia Minor was also a producer.

**RHUMB-LINE,** a line described on the earth's surface by a ship sailing steadily in the direction of any one point of the compass, except one of the four cardinal points. A rhumb-line laid down on a map drawn on the principle of Mercator's projection is a straight line cutting the meridians at a constant angle; but if a rhumb-line be drawn on a globe, so that it will cut the meridians all at the same angle, it will be found to be a spiral curve such that however far it may be produced it will always approach the pole, but never reach it.

**RHUS,** a genus of the cashew-nut family (*Anacardiaceæ*). It is found all around the world, and the species are generally shrubs, with simple or compound leaves, and small five-merous flowers in panicles. The fruit is a dry, one-seeded drupe, often in conspicuous masses. Some, like the American staghorn sumac (*Rhus typhina*), with its tropical appearance and the smoke-tree (*R. cotinus*) are planted for ornament; and the *R. coriaria* is cultivated along the Mediterranean for its leaves, a valuable material for tanning leather, when a fine white color is desired, as in light morocco. The foliage of some other species is also gathered for the same purpose. The American aborigines used *Rhus* berries for red and the juice for black dyes and the bark of *R. glabra* is employed as a mordant for red colors. Oriental lacquer is made from juice exuding from incisions in the bark of *R. vernicifera.* Many species, including the *R. toxicodendrom,* which, like *R. vernix,* is poisonous to the touch (see Plants, Poisonous), are used in medicine, and the acid fruits of certain species are made into cooling drinks or sharpened vinegar. Chinese galls are produced by *R. semialata,* and candlewax is expressed from the berries of the wax-tree (*R. succedanea*) and from *R. vernicifera,* often planted in Japan, for that purpose. One or two species furnish a useful wood.

**RHYACOLITE,** a variety of orthoclase, occurring in glassy crystals in the lavas of Vesuvius, Italy.

**RHYME,** accentual verse, characterized by agreement of terminal sounds. Rhyme was used, in a sense which has now become obsolete, to mark similarity of syllabification in other portions of the line than at the end. Thus the old writers speak of rhyming words when they mean words beginning with the same consonant, that is, in alliteration; also, in Spanish and Portuguese what we now call assonance — a coincidence of vowels in corresponding syllables, without regard to the consonants — was also called rhyme. Rhymes of to-day demand agreement in final syllables of the sound of the vowels and the succeeding or interposed consonants, if there are any, with a dissimilarity of preceding consonants, if there are any. Rhymes of such a character are of three kinds in English: single, or of one syllable, as flap and slap; double, or of two syllables, as greeting and fleeting; triple, or of three syllables, as merrily and cheerily. The single rhymes are often called masculine and the double feminine rhymes. The triple rhyme is used, in English, principally in verse of a conversational or comic or facetious nature. Rhymes of more than three syllables are practically unknown in all except the Persian language and its branches. In the perfect rhymes of to-day the preceding consonants, it has been stated, must not be the same; thus, partake and lake make perfect rhymes, but not partake and take, which makes an inelegance to the ear. The final syllables, moreover, of the perfect rhymes must both be accented; thus butterfly will not rhyme with terribly, although the final syllables are suited in other respects for rhyming. There are, however, rhymes which occupy middle ground — permitted by the exigencies of the occasion in which they are used (known as poetic license) — which are not to be tolerated in ordinary occasions or if frequently used. Such rhymes are those that nearly coincide in sound and which do not offend the ear by failing entirely to do so. Thus gone may be rhymed with alone under poetic license. There is no rule by which a permissible imperfect rhyme may be determined and the only criterion is to be found in good usage as established by the better class of authors. Some languages incline more to the masculine rhyme, as the English, on account of its superabundance of monosyllables; others, as the Spanish and Italian, more to the feminine; the German and French possess an almost equal store of both. The feminine rhymes in French all contain an *e* mute in the last syllable; and from the beginning of the 16th century it has been the almost uniform practice among French poets in dramatic, heroic, elegiac, satirical and other forms of poetry to make couplets of masculine rhymes alternately with others of feminine rhymes. In the ode combinations of rhymes are used, but always regular. When two successive lines rhyme they form a rhymed couplet, the measure used by Pope in his famous ‹Essay on Man.› Three successive rhyming lines form a triplet; four a quatrain, but there may be two pairs of rhymes in a quatrain. Rhymes are used throughout poetry in accordance with the author's own taste and inclinations. In some poetry every line is rhymed with some other. And this may be an adjacent line or one separated from its partner by one or more lines which do not end with the same rhyme, but with some other. The position of the rhyming pairs in the stanzas must be the same in each verse of the composition, and, moreover, within the stanzas the rhymes must occur regularly, according to some fixed scheme. In long poems, indeed, it is not infrequently the case that different portions of the poem employ stanzas in which the rhyme schemes differ. This is permissible because, on account of the length of the composition, the effect is the same as if it were composed of several shorter poems.

It is not necessary that every line in the poem should rhyme, and some of the pleasantest effects have been produced by the use of a mixture of rhyming and not-rhyming lines. When rhyme is totally absent poetry is spoken of as blank verse. The rhyme does not always occur only at the end of lines. It sometimes occurs at two places within the line, at the middle and at the end. But this is only a supplementary or secondary rhyme; it is not to be used except in conjunction with lines which have proper or terminal rhymes.

The rhyme scheme employed, in conjunction with the kind of measure used, determines the structural character of poetry (q.v.). The most complex forms now used in English are found in the sonnet (see POETRY) and in the Spenserian stanza, so-called because adopted by Spenser and used in his ‹Faerie Queene.› There are a number of artificial forms of verse known as the French forms, because invented and brought to perfection by the poets of that nation, in which the positions of the rhymed lines vary greatly not only in the stanzas, but in the poem as a whole. The most commonly employed of these forms are the triolet, rondel, rondeau, vilanelle and ballade.

The modern use of rhyme was not known to the ancient Greeks and Romans. We meet, indeed, with some rhymed verses in Ovid, in which the rhyme was evidently intentional; but these examples are rare. It has been used, on the other hand, from time immemorial among the Chinese, Hindus, Arabs and other Oriental nations. Rhyme began to be developed among Western nations in the Latin poetry of the Christian Church. It is found used as early as the 4th century, and in subsequent centuries grew to common use in the writings of Church officers and ecclesiastical students. The use of rhyme in the vulgar dialects of Latin was even more general than in ecclesiastical poems, as is shown by the poetic monuments of the Romance nations belonging to the 9th and 10th centuries. In the Latin poems of the Fathers of the Church of the 4th century rhymes are more frequently used. The most ancient relics of Teutonic and Scandinavian poetry are not in rhyme, but are distinguished by alliteration. The earliest use of rhyme in a Teutonic dialect is in Otfried's ‹Evangely,› written in Frankish, in the latter part of the 9th century. The oldest forms of rhymed verse are the couplet and the continuation of one and the same rhyme through a whole piece. The oldest poems of the Chinese, Indians, Arabians and of other ancient peoples are rhymed; so are those of the Irish and the Welsh. In the fragments of the earliest Latin poetry yet found, where the metre is accentual, not quantitative, there is a marked tendency toward rhymed endings. This tendency was lost for a time under the influence of Greek poetry in which the measures are quantitative. Still the partiality for rhymes was not lost, as is proven by the verses of Ovid, and upon the decline of classicism, they became common. An attempt at sustained rhymed verses can be found as far back as the 4th century, as evidenced in the verses of Hilary. By the end of the Middle Ages rhymed Latin verse had reached its perfection. For a general discussion of rhyme schemes and verse-forms consult Raymond, G. L., ‹Rhythm and Harmony in Poetry and Music› (1895); Guest, ‹History of English Rhythms› (1838); Parson, ‹English

Versification›; Trench, R. C., ‹Sacred Latin Poetry.›

**RHYMER, Thomas,** the familiar name of an early Scottish poet, whose real name is supposed to have been Thomas Learmount. He flourished in the latter part of the 13th century at Ercildoune (modern Earlston), Berwick. To this day the name of Thomas the Rhymer is popularly known in Scotland as that of a prophet, who derived his powers from residence in Fairyland; and it is only through the discovery of the manuscript of a metrical romance called ‹Sir Tristram› (supposed by Scott to be his work, though this is still a matter of dispute) that he has acquired a better claim to remembrance. A good edition of the ‹Tristram› is that of M'Neill (Scottish Text Society, 1886). Consult also Murray's edition of the ‹Romance and Prophecies of Thomas of Ercildoune› (Early English Text Society, 1875); Scott's ‹Minstrelsy of the Scottish Border› (1806); and Child's ‹Popular Ballads› (Part II, 1884).

**RHYNCHOCEPHALA,** rĭn-kō-sĕf'ạ-lạ, an order of very ancient prosaurian reptiles, fossil chiefly in the Old World Triassic, having much superficial resemblance to lizards. They are characterized by a fixed quadrate bone, an inferior temporal arcade, a closed palate and separate premaxillæ. They were unarmored, terrestrial, lizard-like creatures, varying in length from a few inches to six or eight feet. Important genera are *Rhynchosaurus, Hyperodapedon, Homœosaurus,* found in Europe and India. The most remarkable genus, however, is *Sphenodon* (or *Hatteria*), one species of which is still living in New Zealand. See Tuatera.

**RHYOLITE,** a silicious porphyritic rock resembling granite in chemical composition. The name was first given by Richthofen to igneous rocks in Hungary distinguished from trachyte mainly by a more varied texture and the presence of quartz. The western Cordilleras of America, as well as like regions elsewhere, contain rhyolite in vast areas. Rocks of the same or similar structural character are now known also under the names of liparite and nevadite. The rocks which petrographers formerly classed among felsites are now mainly described under the name of rhyolite, which includes a much greater number of varieties.

**RHYTHM,** rĭthm, (a) *in metrics,* the measure of time or movement by means of a numerical proportion or harmony. (b) *In prose literature,* it follows no regular law, but consists in an arrangement of words in an expressive succession. This arrangement may at times approach the regularity observed in rhythm in verse; and the term prose-poetry has been applied to the prose in which such regularity is strongly marked. In poetry, rhythm is reduced to law and consists in a regular succession of arses and theses (long and short; accented and unaccented syllables). This results in a precise cadence or variety of cadences; modified, of course, by the pauses necessary to rhetoric. (See Phrase; Rhyme). (c) *In music,* the swing and sweep of a composition, emphasized by the accents ringing out in their proper places and attaining a series of climaxes in the special stress given to each metrical division of the work, accent being the life of rhythm. (See Music; Musical Elements and Terms). (d) *In psychology,* the movement or intervals expressive of emotion and feeling set up by changes of relative duration and of quality between recurrent brain-stimuli. (e) *In physiology,* the proportion as to time between the action of an organ, of an intermittent or remittent disease, etc., at successive periods, as in respiratory rhythm establishing first the number of inspirations per minute in normal breathing, then showing the greater or less frequency in certain states of health.

**RHYS,** rēs, **Ernest,** Welsh author and critic: b. London, 17 July 1859. He was educated at Bishops Stortford and Newcastle-on-Tyne and in 1877 became a mining engineer. In 1885, however, he turned his entire attention to literature and in 1887 made a lecturing tour in the United States. He was editor of the Camelot series of reprints and translations (65 vols., 1886–91), of ‹The Lyric Poets› (12 vols., 1894–99) and other publications and has written ‹The Great Cockney Tragedy› (1891); ‹Welsh Ballads and other Poems› (1898); ‹Frederick Lord Leighton› (1898); ‹The Whistling Maid› (1900); ‹Celtic Lore› (1901); ‹Ogam-inscribed Stones Preserved in Dublin› (1902); introductions to several volumes of ‹Everyman's Library,› of which he is general editor. Other works are ‹The Fiddler of Carne› (1896); ‹The South Wales Coast› (1911); ‹Lyric Poetry› (1913); ‹Romance› (1913); ‹Rabindranath Tagore› (1915).

**RHYS,** Sir **John,** Welsh Celtic scholar: b. Ponterwyd, Cardiganshire, 21 June 1840; d. 1915. He was educated at Bangor Normal College for the teaching profession; kept a school in Anglesey till 1865 and in 1869 was graduated from Oxford. Continuing his studies at the Sorbonne and Collège de France in Paris, Heidelberg, Leipzig and Göttingen, in 1871 he was appointed inspector of schools for Flint and Denbigh, and in 1877 professor of Celtic in Oxford University, becoming in the same year an honorary Fellow of Jesus College, of which he served as principal after 1895. He was already known as a Celtic scholar before the publication, in 1877, of his ‹Lectures on Welsh Philology› gave him a high reputation in this department of scholarship. Later works are ‹Celtic Britain› (1882); ‹Origin and Growth of Religion as Illustrated by Celtic Heathendom› (1887); ‹Studies in the Arthurian Legend› (1891); ‹The Early Ethnology of the British Isles› (1891); ‹Inscriptions and Languages of the Northern Picts› (1892); ‹Celts and Pre-Celts; The Welsh People› (1900) in collaboration with J. B. Jones; and ‹Celtic Folk-lore› (1901). He also edited various Welsh texts in conjunction with J. G. Evans.

**RHYTINA.** See Sea-cow.

**RIALL,** rī'ạl, Sir **Phineas,** British military officer: b. County Tipperary, Ireland, 15 Dec. 1775; d. Paris, France, 10 Nov. 1850. He entered the British army as ensign in 1794 and became major in the same year. In 1804 he was attached to the 15th Foot and in 1808–10 commanded a brigade in the West Indies. He was promoted major-general in 1813 and ordered to Canada to participate in the war against the United States. He served on the Niagara frontier and was chief in command in the campaign against Gen. Jacob Broun in the following summer. He was defeated at Chippewa and at Lundy's Lane, being severely wounded and taken prisoner in the latter engagement. He was appointed governor of Grenada in 1816, was knighted in 1833 and in 1841 received full rank as general. Consult Morgan, 'Sketches of Celebrated Canadians and Persons Connected with Canadian History' (1862).

**RIALTO,** rē-äl'tō, (1) the principal bridge of Venice (q.v.), the only one spanning the Grand Canal. It consists of a single arch 90 feet in span and 24 feet high, and was built of marble at a cost of over $500,000, in 1590. Two ranges of shops divide the bridge road into three narrow parallel streets. Shakespeare mentions the bridge and contiguous promenades as a rendezvous in 'The Merchant of Venice,' and the term has become synonymous with the meeting places of the theatrical profession in most populous centres. (2) The Rialto in New York was first applied to the section on 14th street, between Broadway and Fourth avenue; but has now extended to the portion of Broadway, between 40th and 50th streets.

**RIAZAN,** or **RYAZAN,** Russia, (1) city, capital of the government of Riazan, on the Trubesh, a branch of the Oka. It is in an agricultural region, in which the chief product exported is rye. The chief manufactures of the city are woolen and linen goods, leather and needles. Nearby is the village of Grishina, in which are large cutlery works. Pop. about 48,000. (2) The government of Riazan has an area of 16,254 square miles. It is drained by the Oka and its tributaries. The chief manufactures are cotton, linen and woolen goods and leather. Rye is the principal grain exported. Pop. about 1,900,000.

**RIB.** The ribs are a series of flattened, narrow bones which together with the sternum in front and the vertebral column behind form the bony cage which encloses the thoracic organs and supports the muscular structures surrounding the chest cavity. In man there are 12 pairs of ribs, of which the first seven articulate directly with the sternum by means of their costal cartilages and are called the *true* ribs. The cartilages of the eighth, ninth and 10th ribs join the cartilage of the seventh rib and are, therefore, termed *false* ribs, while the 11th and 12th ribs are free at their anterior extremities and are spoken of as the *floating* ribs. The seventh rib is the longest of the series, the others decreasing progressively in size to the first and to the 12th. The seventh is considered the most representative rib, and is described as having an anterior or sternal extremity, a shaft and a posterior or vertebral extremity. The sternal end is hollowed slightly to receive the cartilaginous prolongation by which it is connected with the sternum. The shaft is flattened and has an external and an internal surface. Its lower edge is slightly grooved to shelter the intercostal vessels and nerve which run parallel to and close to it. The head presents two facets which articulate with the bodies of two adjoining dorsal vertebræ, and the neck is the short portion between the head and the beginning of the shaft. At the junction of the neck with the shaft there is a small swelling called the tubercle which has an articular facet for contact with the transverse process of the lower of the two vertebræ with which the head articulates, and a roughened area for the attachment of a ligament. The rib presents two curvatures, one around a vertical axis and the other about a horizontal axis, the effect of which is that the bone cannot be laid on a plane surface in such a way that both ends and the shaft between shall be in contact with it. The point at which the curvature is most acute is called the angle of the rib. Most of the ribs are so placed in the body that their sternal extremities are much lower than their points of attachment to the vertebral column, and through this arrangement as well as their peculiar curvature, when they are raised in inspiration the capacity of the thorax is increased both in its anteroposterior and lateral diameters. In some diseases, notably rickets (q.v.) and emphysema (q.v.), which are characterized by changes in the shape of the chest, the ribs undergo alteration in curvature. In children having rickets the anterior portion of the ribs sinks in so that the sternum becomes more prominent and the ends of the ribs may be enlarged and beaded, forming what is called the «rachitic rosary.» If, in addition to rachitis there is present some respiratory obstruction from such causes as adenoids, nasal catarrh, etc., the «pigeon» or «keel» breast may result. In this the lateral compression is carried to a more extreme degree and the cross-section of the chest approaches the triangular shape with the apex forward. A funnel-shaped depression over the lower point of the sternum is sometimes caused by rickets, but may be congenital or due to the habitual pressure of a work bench or tools, as in cobblers, for example. In the emphysematous chest the ribs are thick and run more nearly horizontal so that an increase in the anteroposterior direction and outward bulging of the middle portion are caused, giving rise to the so-called barrel-shaped chest. The flat chest is the opposite of this, as its name implies, and has a short anteroposterior diameter. It is often associated with a tendency to pulmonary tuberculosis. Very rarely the ribs are more or less numerous than normal, but a not unusual deformity is the non-attachment of the anterior end of the 10th rib, so that it, too, is a floating rib. This abnormality is by some authorities considered as an indication of a tendency to neurasthenia. Fractures of the ribs are not infrequent injuries. Owing to the more sheltered position of the upper and the greater mobility of the lower members of the series it is most often the fourth to the eighth ribs that are fractured. Unless there is some complication, such as internal injury, the outlook is usually good. The treatment consists chiefly in immobilizing the side of the chest affected by adhesive plaster strapping. In treating collections of purulent fluid in the pleural cavity, it if often necessary for the surgeon to resect portions of one or more ribs in order to secure free drainage. See ANATOMY; OSTEOLOGY; THORAX.

**RIBALTA,** (1) **Francisco de,** Spanish painter: b. in Castellon de la Plana, Valencia, about 1550; d. Madrid, 12 Jan. 1628. Of the Spanish school of painting, he studied first in

Valencia and afterward in Italy, where he came under the influence of Raphael, Piombo and the Carracci. Returning to Spain he was received with honor and engaged to paint pictures for many churches and convents in Valencia. His work is remarkable for grandeur of conception, good taste in composition, freedom of drawing and correct anatomical design, but like other Spanish painters he was an extremist, depicting alternately agony and ecstacy. Among his best pupils were his son Juan (q.v.), Ribera known as Lo Spagnoletto, and Gregorio Castenada. Of his paintings perhaps the best are ‘Dead Christ and Angels,’ ‘Saint Francis,’ ‘Blessed Soul’ and ‘Lost Soul,’ in the Madrid Museum; ‘Saint Francis Embracing Christ,’ ‘Saint Peter,’ ‘Conception’ and ‘Saint John Baptist,’ in the Valencia Museum; ‘Virgin and Saint John Returning from the Sepulchre,’ at Munich; and ‘Saint Joachim and Saint Anne,’ ‘Christ on the Cross’ and ‘Magdalen at Sepulchre,’ at Saint Petersburg. He also painted portraits of many prominent Valencians. (2) Juan de, his son, flourished about 1597–1628. He painted so nearly in his father's style that their works are often confounded. When 18 he painted the admirable ‘Crucifixion’ in the Valencia Museum. Among his works are ‘Saints John and Matthew,’ ‘Saints Mark and Luke’ and ‘A Singer’ in the Madrid Museum; ‘Pope Gregory the Great Celebrating Mass,’ in the Dresden Museum; ‘Jephtha's Sacrifice’ and the ‘Martyrdom of Saint Catherine.’

**RIBAULT,** rē-bō, or **RIBAUT, Jean,** French soldier and colonist in the New World: b. Dieppe, about 1520; d. Florida, 1565. A Huguenot, he was sent by Admiral Coligny to establish a colony of French Protestants in North America. He went out in 1656 with an advance party, with which he built a fortress at Port Royal in the present South Carolina. A garrison of 30, left by him in charge, finally mutinied and, having slain their leader, set out in a crazy vessel for France. Half famished, they were carried by an English cruiser to London. Ribault was made governor of a proposed colony in Florida in 1564 and sent out René de Laudonnière, who built Fort Caroline near the mouth of the Saint John's. In May 1565 Ribault himself with seven vessels and a force of 300 set sail for the colony, where he arrived 28 August. A Spanish expedition under Pedro Menendez de Avilès had, shortly after Ribault's arrival, begun work on intrenchments on the site of Saint Augustine, and Ribault determined on an attack before the fortifications had been completed. His ships, however, were wrecked in a hurricane, and Menendez, marching overland, captured Fort Caroline and butchered almost all whom he found there. Ribault, with most of his force, was saved, endeavored to return but was intercepted by Menendez, and with a portion of his followers were murdered. This ended the Huguenot colony in Florida. Consult Gaffard, ‘La Floride française’ (1875); Parkman, ‘Pioneers of France in the New World’ (1885).

**RIBBECK, Johann Karl Otto,** German philologist: b. at Erfurt, 23 July 1827; d. 1898. In early life he went to Berlin, where he studied under Lachmann, Bopp and Böckh, and from there to Bonn where he was a close student of the methods of Welcker and Ritschl. Having received his degree in Berlin and traveled for a year through Italy, in 1853, he returned to Berlin, where he entered Böckh's school. He then became a teacher, being called successively to Elberfeld, Bern, Kiel, Heidelberg, and finally, in 1877, to Leipzig, there becoming the successor of his former master, Ritschl. Ribbeck's works are mostly confined to criticisms of Latin poetry and to classical character sketches and display a profound knowledge of the classics combined with a brilliant style of essay. Among them are ‘Vergelii Opera,’ with prolegomena and critical notes (5 vols., 1859–69); ‘Tragicorum Latinorum reliquiæ’ (1862); ‘Cornicorum Latinorum reliquiæ’ (1855); ‘Der echte und unechte Juvenal’ (1865); ‘Horace's Epistles’ (1869); ‘Zur Lehre von den Latein Partiketn’ (1860); ‘Die römische Tragodie im Zeitalter der Republick’ (1875); Plautus's ‘Miles Gloriosus’ (1881); the biography of Friedrich Ritschl (2 vols., 1879–81); ‘Geschichte der römischen Dichtung’ (3 vols., 1889–92; 2d ed., 1897–1900); and the classical character sketches (which appeared in the *Rheinische Museum*, of which he became editor in 1876) ‘Alazon’ (1882), ‘Kolax’ (1885) and ‘Agrockos’ (1885).

**RIBBED VAULTING.** See Gothic Architecture; Vault.

**RIBBON,** a narrow web, generally of silk. used for tying and ornamental purposes. Ribbon-weaving is a special branch of the textile industries. In modern looms as many as 40 ribbons are simultaneously woven in one machine. Mixed fabrics of silk and cotton are now largely employed. See Silk and Silk Industry.

**RIBBON-FISH.** See Deep-sea Life.

**RIBBON-SNAKE,** a garter snake (q.v.) of slender form and conspicuous stripes.

**RIBBONISM,** in Irish history, the name given a group of secret associations among the lower classes in Ireland throughout the half century extending from 1820–70, at its greatest height from about 1835 to 1855. Its origin and organization are alike wrapped in obscurity, but it appears in the beginning at least to have been political in its aims, and it seems probable that it grew out of the northern Defenders who banded themselves to oppose the Orange organization. Earlier associations with somewhat similar aims were the Whiteboys and the Threshers, and in particular corners of the island, the Carders, Shanavests and Caravats. Though everywhere condemned by the Roman Catholic clergy, Ribbonism included none but Roman Catholics within its numbers, and it maintained its influence by a system of oaths and secret signs and passwords. One striking feature of Ribbonism, as distinguished from most Irish patriotic associations, was the fact that its adherents belonged exclusively to the very lowest and most ignorant classes, the humbler peasantry, farm servants, laborers and petty shopkeepers, hardly even the smallest farmers or their sons apparently belonging to it in any part of Ireland. So far as there was any unity in its aims, it aimed at making itself a public conscience on all agrarian questions; but, the Ribbonism of one period and of one district was not the Ribbonism of another. In Ulster it professed to be a defensive or retaliatory league against Orangeism. In Munster it was at first a combination against tithe-proctors. In Connaught it was an organization against rack-renting and evictions. In Leinster it often was mere trade unionism. The name originated in a badge worn by the members.

**RIBEIRO,** rē-bā'roo, **Bernardim,** Portuguese poet: b. Torrão, Alemtejo, about 1486; d. about 1550. He appears to have been a gentleman of the chamber at the Portuguese court and to have been involved in an unhappy love affair with Donna Joana de Vilhena, a relative of the king. He was one of the first to introduce in Portuguese literature the Italian pastoral style which has since prevailed in Portugal. Of his writings there are still extant five idylls and several lyrics beside his best-known work, the pastorial romance ‹Menina e Moça› (1554). Editions of the ‹Obras de Bernardim Ribeiro› were published in 1645, 1785 and 1852, and in 1891 an excellent edition of ‹Menina e Moça› with a ‹Prefacio› was edited by Dom Jose Pessanha.

**RIBEIRO-FERREIRA,** fār-rā'ē-rä, **Thomaz Antonio,** Portuguese poet: b. Parada de Gonta, Portugal, 1 July 1831; d. 1901. He was educated for the bar at Coimbra and in 1870 was appointed Secretary-General of the Portuguese colonies. In 1878 was appointed Colonial Secretary, in 1881, Minister of the Interior, and in 1885 and 1890 was Minister of Public Works. He was Minister to Brazil in 1895–96. As a poet he attained high rank, his work exhibiting much grace and a fervid patriotism. His works include ‹Sons que passam› (1854); ‹Vesperas› (1858); ‹Don Jaime› (1861); ‹Delfino do Mal› (1868); ‹Dissonancias› (1890), etc.

**RIBERA,** rē-bā'rä, **José or Jusepe de** (known as «Lo SPAGNOLETTO»), Spanish painter: b. Jativa, kingdom of Valencia, 12 Jan. 1588; d. Naples, 1656. Although early entered at the University of Valencia, he preferred the studio of Francisco de Ribalta (q.v.) to the schools of book-learning. He eventually left Valencia for Naples, and thence took up his residence at Rome, where he was given the name of Lo Spagnoletto, «the Little Spaniard.» Here he studied the works of Raphael and the Caracci. He also visited Parma and Modena and copied the paintings of Correggio. It is, however, very evident that while he was at Naples Cavaraggio exercised a preponderating influence over his style, and though a Spaniard, he must be ranked as one of the most pronounced representatives of the Naturalistic School of Naples. Pedro de Madrazo calls him «a most excellent painter, who finds his place among the greatest Italian masters.» Both in coloring, chiaroscuro and anatomical knowledge he excels many of the Neapolitan school; but he generally chose gloomy, austere or revolting subjects for his powerful brush, and these he treated with a wild and extravagant fancy which deepened the horror each incident inspired, such are his ‹Prometheus Chained to the Rock›; ‹The Torment of Sisyphus›; ‹The Flaying of Saint Bartholomew›; ‹Saint Sebastian Transfixed with Arrows› (all in the Prado Museum, Madrid); ‹The Martyrdom of Saint Lawrence› (Dresden Gallery). His etchings, of which he left 26, are mostly figure pictures of great spirit and power. He had a great number of pupils and imitators, among whom were Salvator Rosa and Lucio Giordano. Consult ‹Diccionario historico de las bellas artes› (1800) and ‹Diccionario Enciclopedico Hispano-Americano› (1895).

**RIBOT, Alexandre Félix Joseph,** French statesman: b. 1842; d. Paris, 30 Jan. 1923. After admission to the Paris bar, he was appointed deputy procurator-general before the Tribunal in 1870, and became secretary-general of the Ministry of Justice in 1878. In that year he was also elected deputy for Saint-Omer, and later senator. He was Foreign Minister in the Freycinet Cabinet formed in 1890, and during his tenure of that office the alliance with Russia was concluded. In 1893 he became Premier during the Panama upheaval, and again after the resignation of Casimir-Périer in 1895. In December 1912 he accepted candidature for the French Presidency, but on 17 Jan. 1913 M. Raymond Poincaré (q.v.) was elected, with M. Briand as Premier. The latter fell on 18 March and was succeeded by M. Barthou, who in his turn was defeated in December. M. Ribot, then Finance Minister, was invited to form a cabinet, but he was unable to gain the necessary support of the Republican party to his policy of conciliation. M. Dupuy met with a similar failure. The next attempt, that of M. Doumergue, succeeded, and Caillaux became Finance Minister. On 26 March 1914 the wife of Caillaux shot Gaston Calmette, editor of the *Figaro,* at his desk, and Caillaux was driven from office. M. Ribot succeeded him at the Ministry of Finance and held that post till March 1917 when he became Premier. In September a change of government brought M. Painlevé to the helm and M. Ribot took the Foreign Office. Four weeks later he resigned, and on 23 Oct 1917 withdrew from public life. Madame Ribot was Miss Mary Burch of Chicago.

**RIBOT, Augustin Théodule,** French painter: b. Breteuil (Eure), 8 Aug. 1823; d. Colombes, 11 Sept. 1891. His only schooling in art was obtained by copying pictures in the Louvre. His early works were household and kitchen scenes; ‹Cooks›; ‹The Dinner Hour›; ‹Interior of the Kitchen›; ‹The Merry Cook› and ‹Poultry.› After 1865 he painted religious subjects; but chose to interpret them by selecting scenes of modern life which he gave with a startling realism. ‹Jesus in the Temple›; ‹Saint Sebastian› and ‹The Good Samaritan,› now in the Luxembourg Gallery, are examples in this vein. In his early days he was forced to practise his art during the night hours, and this no doubt confirmed his predilection for concentrated light and strong shadows. In this he is allied to masters of the Dutch school, while in the frank realism of his methods he is classed with Velasquez and Ribera. In later life he painted historical and genre subjects in addition to his earlier field of subjects.

**RIBOT, Theodule A.,** French psychologist: b. Guingamp, 18 Dec. 1839; d. 9 Dec. 1916. He received his education at the École Normale, Paris, taking his doctor's degree in 1875. For several years he taught at various high schools in France, and then becoming interested in experimental psychology spent several years at Paris developing this science by practical studies. He was the founder of *Revue Philo-*

*sophique,* and its first editor. In 1885 he was in charge of the course of psychological experimentation at the Sorbonne and in 1888 occupied the same position at the Collège de France. His published works, many of which have been translated into English, include ‘La psychologie anglaise contemporaine’ (1870); ‘L'Herédité psychologique’ (1873); ‘Philosophie de Schopenhauer’ (1875); ‘Psychologie allemande contemporaine’ (1879); ‘Les maladies de la mémoire’ (1881); ‘Les maladies de la volonté’ (1883); ‘Les maladies de la personalité’ (1885); ‘La psychologie de l'attention’ (1889); Psychologie des sentiments’ (1896); ‘L'Evolution desidées générales’ (1897); ‘Essai sur l'imagination créatrice’ (1900); ‘Essai sur les passions’ (1906); ‘Problèmes de psychologie affective’ (1910); ‘La vie inconsciente et les mouvements’ (1913).

**RICARDO,** ri-kär'dō, **David,** English political economist: b. London, 19 April 1772; d. Gatcombe Park, Gloucestershire, 11 Sept. 1823. His father was a prosperous Jew, born in Holland, but settled in England in his youth; and was a member of the Stock Exchange. The son was educated in England and later in Holland, but had no university training and entered his father's business at 14. He married early and conformed to the Christian religion, whereupon an alienation with his father necessitated his taking up business on his own account. In this he was immediately successful and made a fortune on the Stock Exchange, at the same time preserving an honorable reputation. In 1799 he became interested in Adam Smith's ‘Wealth of Nations’ and turned his attention to the scientific treatment of questions connected with banking and finance. His first contributions to the subject appeared as letters in the *Morning Chronicle* in 1809 and later appeared in a pamphlet entitled ‘The High Price of Bullion a Proof of the Depreciation of Bank-notes.’ The report of the bullion committee in 1810 coincided with the principles of Ricardo in its attributing the depreciation of the currency to excessive issues of the Bank of England and in recommending a resumption of cash payments. In 1816 Ricardo proposed a scheme for making bank-notes exchangeable for standard bars of gold bullion instead of coined gold. The scheme was adopted in 1819, but had to be abandoned on account of the temptation to forgery. In 1817 appeared his principal work, ‘On the Principles of Political Economy and Taxation.’ This work instead of being a historical or philosophical treatment of the general theme is rather a specialized examination of such factors as value, rent, wages, etc., and his contributions to these subjects, while not absolutely original, yet were for the first time stated with fullness and authority. His writings have had a profound influence upon modern doctrines, though his views are not now fully accepted. James Mill and J. R. McCullock were his disciples. He retired from business in 1814 and in 1819 entered Parliament for the Irish borough of Portarlington. He held the seat until his death and contributed to important discussions of financial questions. Consult ‘Life’ by McCullock (1846). See Political Economy.

**RICASOLI,** rē-kä'sō-lē, Baron **Bettino,** Italian statesman: b. Florence, 9 March 1809; d. near Siena, 23 Oct. 1880. He first entered public life in 1847 when he submitted to the Grand Duke Leopold of Tuscany plans of governmental reform which the latter saw himself forced to adopt. Ricasoli became mayor of Florence in 1847 and in the following year was elected to the Tuscan Parliament, and helped to bring about the recall of the grand duke. After the battle of Novara (1849) and the restoration of Austrian influence he retired to private life and devoted himself mainly to the scientific study and practice of agriculture. When the revolutionary movement of 1859 compelled the grand duke to flee, Ricasoli became Minister of the Interior, and in August of the same year dictator. He resolutely opposed all attempts at a restoration of the grand-ducal government and labored for the annexation of Tuscany to Sardinia, which was accomplished in March 1860. He was made, thereupon, governor of Tuscany, and was a member of the first Italian Parliament which assembled in 1861. In June he succeeded Cavour as head of the ministry and sought to carry out his predecessor's policy, but he could make no head against the opposition, and in March 1862 made way for the ministry of Rattazzi (q.v.). He assumed office once more in the early part of 1866, conducted public affairs with ability during the war against Austria, but met with no success in his internal policy of decentralization and financial reform because of his inability to rally a Parliamentary majority to his support. He resigned in April 1867, to be followed by Rattazzi, but remained a member of the Chamber of Deputies till his death, though taking no very active part in affairs. His ‘Letters and Papers’ were published by Tabarrini and Gotti at Florence in 10 volumes (1886–94).

**RICCIARDELLI,** rēt-chär-dĕl'lē, **Daniele.** See Volterra, Daniele da.

**RICCIO,** or **RIZZO, Antonio,** Italian sculptor and architect: b. Verona, about the middle of the 15th century; d. about 1500. It appears that he was in early life under the Mantegazzas at Certosa, but about 1465 he removed to Venice. During the war with the Turks he was chief engineer of the Venetian republic, and at its close became the chief architect of Venice, in which capacity he rebuilt a portion of the Palace of the Doges. We lack accurate knowledge of the extent and quality of his work. It is certain, however, that he was one of the early apostles of the Renaissance. Two figures in the nude, ‘Adam’ and ‘Eve,’ are in the court of the Palace of the Doges, and are executed in the realistic manner of the Florentine school of that day. The tombs of Doge Francisco Foscari and of Niccoló Trón, both in the Frari, Venice, are ascribed to Riccio, but their style differs much from that employed in the nude figures, being more after the Paduan school.

**RICCIO,** or **RIZZIO, David,** Italian secretary to Mary Queen of Scots: b. Pancalieri about 1533; d. Edinburgh, Scotland, 9 March 1566. He was educated as a musician, and in 1561 went to Scotland in the train of the Marquis of Moretto, Ambassador of the Duke of Savoy. At first a singer in Queen Mary's private chapel, in 1564 succeeded Raulet as the queen's secretary. The causes of his elevation have been variously explained. Coincident with the event was Mary's determination to act in matters of state independently of the Scottish nobles or even of her uncle of Lorraine, and the supposition is natural that in Riccio Mary found a safer confidant than in her former French secretary. After the queen's marriage to Darnley in July 1565, Riccio rose even higher in the favor of Mary, and it was Mary's avowed intention to make him her Prime Minister. His intimacy with the queen aroused the jealousy of Darnley and his haughty behavior made enemies of the nobles. The conspiracy formed to remove the objectionable secretary was precipitated into action by Mary's refusal to pardon Moray and other exiles in England. Its leaders were the relatives of Darnley, Lord Maitland who had fallen from power, and leading Protestants, including probably John Knox; with the English government standing as a neutral abettor. Riccio was dragged from the queen's supper-chamber in Holyrood Palace and despatched with at least 56 wounds.

**RICE, Alice Hegan,** American humorous writer: b. Shelbyville, Ky., 11 Jan. 1870. She was educated at Hampton College, Louisville, Ky., and was married to C. Y. Rice of Louisville, in 1902. Her first book, ‹Mrs. Wiggs of the Cabbage Patch› (1901), attained extraordinary popularity, and was followed by ‹Lovey Mary› (1903); ‹Sandy› (1904).

**RICE, Allen Thorndike,** American editor: b. Boston, Mass., 18 June 1853; d. New York, 16 May 1889. He was graduated at Oxford in 1875 and in 1876 purchased the *North American Review,* of which he became editor. He was one of the promoters of the Charnay expedition which in 1879 investigated the ruins of primitive civilization in Central America and Mexico. He was actively interested in politics, an earnest advocate of a more efficient copyright law and was chiefly instrumental in securing the introduction of the Australian ballot system into the United States. In 1889 he was appointed Minister to Russia, but died before the date set for sailing. He edited ‹Reminiscences of Abraham Lincoln› (1886), and contributed to ‹Ancient Cities of the New World› (1887).

**RICE, Cale Young,** American poet and playwright: b. Dixon, Ky., 7 Dec. 1872. He was graduated at Cumberland University in 1893 and at Harvard in 1895. After holding the chair of English literature at Cumberland University in 1896–97 he resigned to devote his time to literature and travel. He was married to Alice Caldwell Hegan (Rice) (q.v.) in 1902, and has traveled extensively in Europe, Asia, Asia Minor and Africa. Author of (poems) ‹From Dusk to Dusk› (1898); ‹Song Surf› (1900); ‹Mirvana Days› (1908); ‹Far Quests› (1912); ‹Collected Plays and Poems› (1915); ‹Earth and New Earth› (1915); (dramas) ‹Charles di Tosca› (1903); ‹David› (1904); ‹A Night in Avignon› (1907); ‹The Immortal Lure› (1911); ‹Porzia› (1913), etc.

**RICE, Daniel,** circus clown: b. New York, 1822; d. Long Branch, N. J., 22 Feb. 1900. His real name was Daniel McLaren, but he was nicknamed as a child for the old Irish clown, Dan Rice, and on entering the show business adopted that name. He became an acrobat and began his career as a clown with the Seth B. Howe Circus in 1845, attaining an immediate success. He was later connected with Spaulding's Circus, in which he became a partner. His familiarity with the works of Shakespeare won for him the name of «the Shakespeare Clown.» After a season of misfortune, during the Civil War, he was engaged by Adam Forepaugh at a salary of $35,000 a year, and later received $1,000 a week with O'Brien's Circus. He retired in 1882. He was lavish with his money, gave much to charity and on one occasion gave $32,000 to President Lincoln for the benefit of wounded soldiers and their dependents. His popularity as a clown was widespread and lasting, his appearance in the circus ring always exciting wild enthusiasm.

**RICE, Edmund,** American military officer: b. Cambridge, Mass., 1842; d. Wakefield, Mass., 20 July 1906. He entered the Union army in 1861, received rank as captain, was voted a medal of honor by Congress for bravery at Gettysburg and was mustered out with rank as colonel in 1865. He entered the regular army in 1866, was promoted colonel and in 1877 served for a time on the staff of General Skobeleff in the Turko-Russian War. He was appointed inspector-general in 1898, and in 1902–03 was colonel of the 19th infantry. He was retired in 1903. The trowel bayonet, stacking swivel and knife-intrenching bayonet now in use in the United States army were his inventions.

**RICE, Edwin Wilbur,** Jr., American engineer: b. La Crosse, Wis., 6 May 1862. He was educated at the Central High School, Philadelphia, and engaged in practice as an electrical engineer in 1880. He became superintendent of the Thompson-Houston Electric Company in 1883 and was also technical director in 1884–94. He was vice-president of the General Electric Company in 1894–1913, and has since been president of that organization. He is a Chevalier of the Legion of Honor, and in 1917 was president of the American Institute of Electrical Engineering.

**RICE, Isaac Leopold,** American lawyer: b. Wachenheim, Bavaria, 22 Feb. 1850; d. New York, 2 Nov. 1915. Coming to Philadelphia with his parents in 1856, he was educated at the Boys' Central High School of that city, and showing a genius for music was sent to Paris to complete his musical training. In 1868 he visited England where he taught music and the languages for a year when he settled in New York, teaching music for a time and then entering Columbia Law School, from which he graduated in 1880, taking prizes in constitutional and international law. He founded the School of Political Science and was lecturer (1882–83), and subsequently instructor in the Columbia Law School (1884–86). He was a specialist in railroad law and was counsel and director in the lines now constituting the Southern Railroad and for a time foreign representative of the Philadelphia and Reading Railway. He took an active part in the application of electricity to transportation and was prominently identified with many financial interests. He founded *The Forum* in 1885; and as a leader in international chess invented the «Rice Gambit.» He published ‹What is Music?› (1875); produced many songs, orchestral and piano compositions and notable articles in leading reviews. Consult ‹Rice Memorial Supplement› in *American Chess Bulletin*, Vol. XII, p. 269 (New York 1916).

**RICE, James,** English novelist: b. Northampton, 26 Sept. 1843; d. Redhill, Surrey, 26 April 1882. He studied at Queen's College, Cambridge, without taking a degree, and in 1868 became editor and proprietor of *Once a Week*. He was called to the bar in 1871 and while waiting for clients he became London correspondent for the *Toronto Globe*. His first literary success was with the novel ‹Ready Money Mortiboy› (1872), written conjointly with Walter Besant. The novel was dramatized and produced at the Court Theatre in March 1874. Other novels written in partnership with Besant were ‹With Harp and Crown› (1874); ‹The Son of Vulcan› (1875); ‹The Golden Butterfly› (1876); ‹The Monks of Thelema› (1877); ‹By Celia's Arbour› (1878); ‹The Chaplain of the Fleet› (1879); ‹The Seamy Side› (1881). Rice also wrote a ‹History of the British Turf› (1879).

**RICE, Luther,** American Baptist clergyman: b. Northboro, Mass., 25 March 1783; d. Edgefield District, N. J., 25 Sept. 1836. He was educated at Williams College, became interested in foreign missionary work and with Adoniram Judson and several others initiated a movement which led to the establishment of the American Board of Commissioners for Foreign Missions. He was ordained in the Congregational ministry, 6 Feb. 1812, and later in the month went to India to engage in missionary work. Soon after his arrival he united with the Baptists and in 1813 he returned to America to adjust his relations with the board. He then began his labors among the Baptist churches, awakening their interest in foreign missions and raising money to support the work. He was also deeply interested in ministerial education and was instrumental in founding Columbian College, Washington, D. C. He was treasurer of the college and worked energetically in raising funds for it; and he was also engaged as a missionary agent. He was noted for his sermons and was highly influential in the Baptist denomination.

**RICE, Thomas D.,** American comedian: b. New York, 20 May 1808; d. there, 19 Sept. 1860. He was apprenticed to a woodcarver in early youth, but ran away to become an actor. In 1832 he appeared in Pittsburgh as a negro minstrel and became widely popular. He made his London début in 1836 and afterward enjoyed repeated successes in other British cities. He elevated negro minstrelsy to a position of respectability, was almost as famous in England as at home, and for an extended period enjoyed great prosperity. He was extravagant and eccentric, however, and his career ending through a stroke of paralysis he died in poverty. His entertainments included the farces ‹Jumbo Jum› and ‹The Virginia Mammy›; the burlesques ‹Bone Squash Diavolo› and ‹Othello›; and his songs included ‹Jim Crow›; ‹Lucy Long›; ‹Gich a Gittin' Upstairs›; and ‹Clare de Kitchen,› all of which won great popularity.

**RICE, William Marsh,** American capitalist and philanthropist: b. Massachusetts, 1816; d. 1900. He gained a fortune of about $10,000,000 in the cotton business in Texas and bequeathed it as a foundation for RICE INSTITUTE (q.v.) at Houston, Tex. He came to his death through chloroform administered by his valet, who had plotted with Albert J. Patrick (q.v.) and the case developed into a sensational murder trial.

**RICE, Wild or Indian.** See GRASSES IN THE UNITED STATES.

**RICE-BIRD,** in the United States the bobolink (q.v.), so called in the south Atlantic, where it is a serious pest in the late autumn to the rice crop; in the East Indies, a familiar and handsome finch-like weaver-bird (*Munia oryzivora*), also known as the Java sparrow and paddy bird. It possesses a large pinkish bill; the head and tail are black, the belly rosy, the cheeks of the male white and the legs flesh-colored. It is dreaded in southern Asia on account of the ravages it commits in the rice fields, but is frequently brought to Europe and America as a cage-bird.

**RICE INDUSTRY, American, The.** The rice industry had its inception in America about the middle of the 17th century, when Sir William Berkeley made an attempt to raise rice in Virginia in 1647. As this experiment, which was continued for several years, was an utter failure, owing probably to the high latitude in which the seed was planted, it was generally believed that such a crop could not be grown in this country. The fact that this was an error was discovered accidentally, in 1694, when a vessel bound for Liverpool from Madagascar was blown so far out of her course that, having been somewhat injured by the storm, it was decided to put into Charleston for repairs. Among those who boarded the vessel was Landgrave Thomas Smith, and, at his request, the captain gave him a small package of rough rice to be used as seed. Although little faith was expressed in the success of the experiment Smith planted it in proper soil in lower Carolina and his enterprise was rewarded by the growth of a crop that was almost sufficient to meet the needs of the entire colony.

From that day the success of the rice industry was assured. By 1707, the cultivation of rice had extended so widely that no less than 17 ships sailed from Carolina with cargoes of this grain, and, during the 10 years between 1730 and 1739, inclusive, the shipments to Great Britain and other ports amounted to more than 223,787,000 pounds. In 1754, the exports to England alone aggregated over 100,000 barrels of unhusked rice, which was equivalent to 30,000,000 pounds of the cleaned product, and yet the supply that was left was ample for home consumption. From that time until 1784, the yield remained practically the same, but, in that year, the system of water culture was introduced, an innovation which has since resulted in constantly increasing crops.

The following statistical table gives a clear idea of the condition of the industry from the beginning of the 19th century up to 1900, together with necessary information regarding the prevailing tariffs. For the sake of brevity these figures have been grouped in periods of five years, with annual averages. The table is as follows:

Production of Rice in the United States for 120 Years, 1795 to 1920, with Tariff Rates Prevailing from 1789 to 1857.

| Five years ending 30 June | Production for five years (pounds) | Average per year | Tariff on rice | |
|---|---|---|---|---|
| | | | Year enacted | Rate ad valorem |
| 1800.. | 320,631,803 | 64,124,361 | 1789 | 5 per cent |
| 1805.. | 240,044,600 | 48,008,920 | 1792 | 7½ " |
| 1810.. | 274,477,000 | 54,895,400 | 1794 | 10 " |
| 1815.. | 274,867,800 | 54,973,560 | 1800 | 12½ " |
| 1820.. | 282,397,800 | 56,479,560 | 1804 | 15 " |
| 1825.. | 333,447,000 | 66,689,400 | 1812 | 30 " |
| 1830.. | 417,333,600 | 83,460,720 | 1818 | 15 " |
| 1835.. | 457,282,200 | 91,456,440 | 1832 | Free |
| 1840.. | 429,585,600 | 85,917,120 | 1836 | 15 per cent |
| 1845.. | 481,669,200 | 96,333,840 | 1841 | 20 " |
| 1850.. | 543,494,400 | 108,698,880 | 1857 | 15 " |
| 1855.. | 483,279,600 | 96,655,920 | ........ | ........... |
| 1860.. | 545,592,600 | 109,118,520 | ........ | ........... |
| 1865.. | 115,738,680 | 23,147,736 | ........ | ........... |
| 1870.. | 160,837,790 | 32,167,558 | ........ | ........... |
| 1875.. | 276,704,430 | 55,340,886 | ........ | ........... |
| 1880.. | 415,332,000 | 83,066,400 | ........ | ........... |
| 1885.. | 534,720,400 | 106,944,080 | ........ | ........... |
| 1890.. | 675,950,400 | 135,190,080 | ........ | ........... |
| 1895.. | 762,698,460 | 152,539,692 | ........ | ........... |
| 1900.. | 822,596,280 | 164,519,256 | ........ | ........... |
| 1905.. | 2,232,051,133 | 446,410,226 | ........ | ........... |
| 1910.. | 2,982,233,223 | 596,446,645 | ........ | ........... |
| 1915.. | 4,000,000,000 | 750,000,000 | ........ | ........... |
| 1920.. | 9,371,565,000 | 1,874,313,000 | ........ | ........... |

Although the superiority of American rice was a well-established fact long before the Civil War the success that planters have attained since 1865 has been indicated in a better quality of rice. In the old days, before the war, when Ward's famous «long grain Carolina» rice was the standard of perfection, Georgia and the Carolinas were the only States in which rice was grown to any great extent. In nearly all the other southern States its cultivation was merely for home consumption. Since the war, however, there has been a change in these conditions: Georgia and the Carolinas have retained their rice fields, but other southern States have evinced an increased interest in the cultivation of this product, Louisiana and Texas being particularly notable examples of the gigantic strides which this industry has taken.

The southern rice fields upon which the best commercial crops are grown are the reclaimed cypress swamps and the tide-water lands along the coast. Of course, many of the finest plantations are among the marshes higher up the rivers, or even in the interior upon level tracts that are so situated that they may be irrigated with ease. In nearly all of these plantations the system of water cultivation is followed. In the case of the tide-water lands, they lie along the rivers, above the meeting of fresh and salt water, in such a position that they may be flooded with water when the tide is high and drained at low tide. Thoroughly protected by dikes, the salt water, which is so fatal to the rice, cannot reach them from below, nor can freshets sweep them from above.

The serious check which this industry received during the Civil War was not forgotten upon the declaration of peace. Lands there were in plenty, but there was no money to operate them, and it was not until incidental protection was derived from the tariff that any vigorous attempt was made to rehabilitate the old plantations. Since that time the greatest advancement has been made in Louisiana, and, during more recent years, in Texas.

The history of rice culture in Louisiana dates back to 1718, but, during all the years prior to the war, this industry was confined chiefly to the parish of Plaquemine. Experience had shown, however, that, in Louisiana, rice was a sure crop, upon which a fair price could be realized quickly without the outlay of a great amount of money, and so, in the uncertain days that followed 1864, it was to rice that the planters turned, with the result that a crop which had never been able to do more than supply a local demand, suddenly sprang into a position of national importance. So great and lasting was this impetus that, by 1875, the State of Louisiana was furnishing fully 30 per cent of the total yield of the United States, while in each of the five years following 1880, it averaged 40 per cent; 1885, 60 per cent; 1890, 65 per cent; and 1895, 75 per cent. As the industry grew in other States this percentage fell off, and in 1916 Louisiana produced about 50 per cent, Texas 25 per cent and Arkansas 16 per cent. The year 1916 saw the largest acreage ever planted in the United States, 866,000, and the crop was 41,325,000 bushels, or 47 bushels per acre, far the best American average recorded. The best 10-year average is 34.7 bushels per acre. Before the World War the United States exported considerable rice to British India and French Indo-China, and also imported small quantities from the Dutch East Indies, Germany, Japan, China, etc. The Philippine Islands production is nearly double that of the entire United States.

India's production of rice is about 56,000,000,000 pounds annually; China's is probably as great; Japan grows 20 bushels to an acre, and the Siam crop is seven to eight times the American. The world's production is estimated at about 150,000,000,000 pounds annually.

The American storage facilities for rice are mainly in the southern States where it is grown. The mills, elevators and warehouses there have a total storage capacity of about 40,000,000 bushels, of which one-half is in Louisiana and more than a fourth in Texas. This capacity is the equivalent of a year's crop.

**RICE INSTITUTE**, a coeducational institution for higher education, established in 1912 at Houston, Tex., by means of a fund of about $10,000,000 bequeathed for the purpose by William Marsh Rice (q.v.). It was incorporated in 1891 as the William Marsh Rice Institute for the Advancement of Literature, Science and Art, and at this time Mr. Rice gave the institute $200,000 to enable the board of trustees to work out the plan under which it should be operated, actual establishment of the organization to take place after his death. The realization of the project was delayed by the years of litigation which followed the murder of Mr. Rice, in 1900; but in 1912 the institute was opened, with Dr. Edgar Odell Lovett as president. The institute has a campus of 300 acres, situated about three miles from the heart of the city; the buildings and grounds are valued at about $1,500,000, and the annual income is about $500,000. The courses of instruction are those usually afforded by colleges of the first class, with additional courses in chemical, electrical and mechanical engineering and architecture. The institute gives the usual degrees of a college of the first class. Tuition and matriculation are free. In 1919 the institute had 50 instructors, 651 students in attendance and 325 in the United States service. Dr. Lovett has been its president from its initial establishment.

**RICE LAKE,** Wis., city in Barron County, on the Red Cedar River and on the Chicago, Milwaukee and Saint Paul and Northwestern railroads, about 45 miles north by west of Eau Claire. Noted as a summer resort. It is in a lumber region and the chief industries are connected with farm and lumber products. It has public and parish schools, a public library, teachers' training school and private business schools. The city has adopted the commission form of government and has a fine sewerage system. Pop. (1920) 4,457.

**RICE PAPER,** also called **PITH PAPER,** and more properly, as the substance is not derived from rice. The product of a small tree, 10 to 15 feet high, known botanically as *Aralia* (*Fatsia*) *papyrifera,* which grows in many portions of Formosa. Japanese name, Tsuso; Chinese name, Tung Tsao. The pith is extracted by breaking the bark and outer woody portion and forcing out the cylindrical core. Consul Jas. W. Davidson states that the paper is produced by skilfully paring these cylinders of pith with a sharp knife as they are rolled upon the surface of a tile or other hard substance that will serve as a bed plate, the thickness of the sheet of pith paper being regulated by the angle at which the knife is held. The sheets are put under heavy pressure for a time, and are finally cut into squares of three and one-half inches and packed 90 in a package. There are three grades of the paper, which is chiefly used for the manufacture of artificial flowers and also for the painting of small fancy pictures, and to some extent for sun hats. Tamsui is the port of shipment, and as high as 28,000 pounds have been exported in a single year, worth over 15,300 yen. See also PAPER.

**RICH, Edmund.** See EDMUND, SAINT.

**RICH HILL,** Mo., city in Bates County, on the Osage River; and on the Kansas City, Fort Scot and Memphis and the Missouri Pacific railroads, about 83 miles south of Kansas City. It is in an agricultural and coal region; in the vicinity of the largest coal fields in Missouri. Its chief industries are connected with the mining and shipping of coal. It has vitrified brick and tile works, canning factories, a foundry, distillery, machine shops and zinc smelters. It has an extensive trade in coal, farm products, canned goods and brick. The principal public buildings are the churches and schools. Pop. 2,755.

**RICH MOUNTAIN, Battle of.** After the reverse of Colonel Porterfield at Philippi (see PHILIPPI, ENGAGEMENT AT) General Lee ordered Gen. H. A. Wise to the Kanawha Valley and Gen. R. S. Garnett to the Cheat Mountain region. Garnett was to relieve Porterfield, recover lost ground and secure control of the Baltimore and Ohio Railroad. With one regiment he arrived at Huttonsville on 14 June, where he found Porterfield with about 1,400 men. Leaving Porterfield at Huttonsville with three companies to guard his line of communication with Staunton, Garnett marched on the night of the 15th to Beverly, from which point a regiment, a company of cavalry and two guns were sent by the Parkersburg road to the west foot of Rich Mountain, seven miles west of Beverly; Garnett, with the other regiment, two guns and a company of cavalry pushing on to Laurel Hill, the northern extension of Rich Mountain, 17 miles northwest of Beverly. These positions were regarded as the gates to northwestern Virginia, and both were strongly fortified. By 1 July Garnett had nearly 4,000 men, including his reserve at Beverly and Huttonsville.

General McClellan arrived at Grafton 23 June and prepared to expel the Confederates from their positions and to enter the Shenandoah Valley. He had 20,000 men; 5,000 along the line of the Baltimore and Ohio Railroad; a brigade of over 3,000 and a battery, under Gen. T. A. Morris, were stationed at Philippi, and by 2 July the main column, under his own immediate command, was concentrated at Buckhannon, 24 miles west of Beverly. This column of over 10,000 men, with 12 guns, was organized into three brigades, under Gen. W. S. Rosecrans, Gen. N. Schleich and Col. R. L. McCook. On 2 July Gen. J. D. Cox was ordered to cross the Ohio with a brigade and co-operate with McClellan by moving up the Kanawha Valley against General Wise. On 6 July Morris was ordered to march his brigade from Philippi to within a mile and a half of Garnett's position at Laurel Hill, and on the 9th McClellan had the three brigades of his own column at Roaring Creek, two miles from the west foot of Rich Mountain, where Lieut.-Col. John Pegram was intrenched, with 1,300 men and four guns. Preparations were made to assault Pegram in front with Rosecrans' brigade, on the morning of the 11th, but on the evening of the 10th Rosecrans learned that Pegram's rear could be reached by a difficult route around his left and proposed to do it with his brigade. To this McClellan assented. It was arranged that Rosecrans should march at daybreak of the 11th, with about 1,900 men, gain the road in Pegram's rear, march down it and attack, and that at the sound of the engagement in the rear McClellan would attack in front. Rosecrans, after a very hard march, made the turning movement, and coming to the road about 3 P.M. unexpectedly came under fire of musketry and artillery and was checked. Pegram had been warned of danger to his rear, and during the morning had sent two detachments to Hart's farm, at the summit of the mountain, with Maj. J. A. De Lagnel in command, who took with him a gun of his battery, and threw up breastworks for his 310 men. Rosecrans attacked, was at first repulsed, and it was not until after a sharp engagement of nearly two hours that he succeeded in driving the Confederates from position, just as Pegram was approaching with reinforcements and another gun. A part of the reinforcements became involved in the defeat, and Rosecrans captured the two guns. Nothing had been heard from McClellan, and knowing that a considerable body of Confederates was still near him, Rosecrans directed his men to lie on their arms until morning. Rosecrans lost 12 killed and 49 wounded. The Confederates had made a gallant fight, with a loss of 40 to 45 killed and about 25 wounded. The noise of the engagement had been heard in McClellan's ranks and he prepared for an attack in front, but the long continuance of the artillery-fire on the mountain and some cheering in Pegram's camp impressed him that it had gone badly with Rosecrans and the attack was not made, and near night he withdrew his troops beyond Roaring Creek. At daybreak of the 12th Rosecrans found that the Confederates had disappeared, and marching down the mountain he entered Pegram's abandoned camp, taking two more guns, with some sick and wounded, and as nothing was seen of McClellan, he sent him word of what he had been doing and where he was.

The forces engaged with Rosecrans on the mountain top succeeded in passing around his right during the night to Beverly, where they were joined by the 44th Virginia and the retreat was continued through Huttonsville and across Cheat Mountain to Greenbrier River, and then to Monterey. Pegram abandoned his works, intending to follow his detachment to Beverly, but in the darkness his column was broken up, part reaching that place. Pegram led the remainder to join Garnett, marching all day of the 12th and halting at night in the valley six miles north of Beverly. There, hearing that Garnett had retreated northward, and that McClellan was at Beverly, and seeing no chance of escape, he sent to McClellan an offer of surrender. This was accepted and next morning Pegram surrendered 30 officers and nearly 500 men. Garnett, at Laurel Hill, informed of the disaster that had befallen Pegram on the 11th, abandoned his works after dark, and retreated toward Beverly. When within five miles of the place, at daybreak of the 12th, he received erroneous information that McClellan had already occupied it, whereupon he retraced his steps and retreated north toward Saint George and West Union, hoping to escape by the Northwestern Turnpike, but was overtaken by Morris at the fords of Cheat River, at noon of the 13th and killed in a rearguard fight at Corrick's Ford. His army continued the retreat through Red House, Greenland and Petersburg to Monterey. McClellan occupied Beverly on the 12th and Huttonsville on the 14th, and pushed his advance to the summit of Cheat Mountain. Leaving a force on Cheat Mountain and at Huttonsville he returned to Beverly on the 16th. A few days later McClellan was called to Washington and assigned to the command of the troops for the defense of the city. On 1 November he became commander of the army of the United States. His short and successful campaign, with that of General Cox up the Kanawha Valley, settled the fate of West Virginia, stimulated the Union men in their effort to form a new government and finally resulted in the dismemberment of Virginia and the formation of the new State of West Virginia. Consult 'Official Records' (Vol. II); The Century Company's 'Battles and Leaders of the Civil War' (Vol. I).

E. A. Carman.

**RICHARD I,** king of England: b. Oxford, 8 Sept. 1157; d. Chaluz, France, 6 April 1199. He was the 3d son of Henry II of England and Eleanor of Aquitaine, and while an infant was betrothed to Alice, a daughter of Louis VII of France. Made duke of Aquitaine in boyhood, he took part in the rebellion of his brothers against his father, who at different times attempted to deprive Richard of his possessions, and even planned to exclude him from the succession to the Crown in favor of the younger son John. In 1189, in conjunction with Philip Augustus of France, he waged war on his father and compelled Henry II to acknowledge his right to the throne. Two days after the conclusion of peace Henry II died at Chinon (6 July 1189). In September he was crowned king at Westminster and immediately began preparations for a crusade to the Holy Land, in fulfilment of a vow made two years before. To raise money for the expedition he sold fiefs and offices, surrendered to William the Lion of Scotland the suzerainty over that country, and increased the burden of taxation. Proceeding through France he joined the army of the French king at Messina, where he became involved in a conflict with Tancred, King of Sicily, in the course of which the English king made himself master of Messina. The intrigues of Philip Augustus brought on enmity between the two sovereigns and Richard repudiating his betrothed, Alice, sister of the French king, secured the hand of Berengaria of Navarre, who joined him at Cyprus, where they were married. After he had conquered the island and seized its treasures he joined the crusading army before Acre (8 June 1190). Between the English and the French bitter feelings now prevailed and at one time hostilities were threatened. Acre, nevertheless, was taken by the crusaders, and in August Philip sailed for Europe. War with Saladin (q.v.) was renewed on account of Richard's atrocious massacre of 2,700 Mohammedan prisoners. At Arsuf, 7 September, Richard won a decisive victory and in spite of prolonged negotiations moved on Jerusalem, arriving in December 1191 within a very short distance of the city. He fell back to Ascalon, where the contest between Guy of Lusignan and Conrad of Monferrat for the kingdom of Jerusalem was productive of dissensions among the crusaders. A second advance on Jerusalem met with ill success and in August 1192 Richard concluded a three years' truce with Saladin and left the Holy Land, having made no conquest beyond that of Acre. Shipwrecked in the Adriatic, he attempted to make his way disguised through Germany, but was taken prisoner near Vienna by his enemy, the Duke of Austria, who handed him over to the emperor. Brought before the imperial diet, Richard pledged himself to a ransom of 150,000 marks and received his English kingdom as a fief from the emperor. The influence of the French king and Richard's own brother was effectual in prolonging the English king's imprisonment. Liberated in March 1194 he landed in England in the same month and was crowned a second time. John was forced to submit and Richard, collecting all the money he could for a war with Philip of France, sailed for Normandy in May. The contest which dragged on for five years presents little that is noteworthy, and in January 1199 peace was made. While besieging the castle of Chaluz, held by a vassal with whom Richard disputed the possession of a newly found treasure, the king was wounded by an arrow and died in his tent. Richard I owes his fame to the glamor with which legend has surrounded his name as the typical warrior of the Middle Ages. As a king he did nothing for England; his great passion was war, and the only redeeming features in a character of violence and ferocity are a certain naive magnanimity and the splendid courage which gained him even in his lifetime the title of Cœur de Lion, «Lion-hearted.» The legend which recounts how Richard immured in an Austrian prison was discovered by his favorite minstrel, Blondel, who had wandered throughout Europe singing his songs outside of castle walls, dates from the second half of the 13th century. Richard figures prominently in Scott's ‹Ivanhoe› (1820); and ‹The Talisman› (1825), and in Maurice Hewlett's ‹Richard Yea and Nay.› Consult Stubbs, ‹Early Plantagenets› (5th ed., 1886); Norgate, ‹History of the Angevin Kings› (1887); Archer, ‹Crusade of Richard I› (1889); Round, ‹Feudal England› (1895); Stubbs, ‹Constitutional History of England,› Vol. 1 (6th ed., 1897).

**RICHARD II**, king of England: b. Bordeaux, 6 Jan. 1367; d. Pontefract, Yorkshire, February 1400. He was a younger son of the Black Prince and a grandson of Edward III, and succeeded to the throne on the death of his grandfather in June 1377, at a time when England was suffering from the effects of the black death, the demoralizing results of the war with France, and the misgovernment by faction that marked the latter part of the reign of Edward III. The young king was placed under the control of a council in which his uncle, John of Gaunt, Duke of Lancaster, exercised a predominant and, on the whole, pernicious influence. Popular disaffection, fed by the ill success of the government in repelling attacks on the part of the French and the Scots, was intensified by the increasing burden of taxation. The imposition of a new capital tax in 1380 led to the outbreak of the celebrated Peasants' Revolt in 1381. (See Tyler Insurrection). Richard displayed great presence of mind in dealing with the insurgent forces near London, and to his bearing was largely due the speedy suppression of the revolt, which was directed largely against John of Gaunt. In 1382 he married Anne of Bohemia and about the same time sought to free himself from the control of Parliament by building up a party of his own with Robert de Vere, Earl of Oxford, and Michael de la Pole, Earl of Suffolk, as a nucleus. Richard thereby came into conflict with John of Gaunt who in 1386 departed for France. The leadership of the opposition fell to the unscrupulous Duke of Gloucester, the youngest of the king's uncles. In 1387 Parliament, controlled by Gloucester, demanded the dismissal of the chancellor de la Pole, and of Oxford, who had been made Marquis of Dublin with sovereign rights in Ireland, and though the king refused to yield, he was compelled to accept a committee of 11 appointed by Parliament with extensive power of government for a period of one year. Suffolk was dismissed. When Richard set himself to overthrow the committee, the Duke of Gloucester and the earls of Arundel, Derby, Nottingham and Warwick took up arms, marched on London, demanded the trial of five of the king's principal advisers on the charge of treason and brought about their condemnation by Parliament. Forced to submit for a time, Richard succeeded in throwing off his uncles authority in 1389 and for the ensuing eight years ruled with moderation and in peace. He had not abandoned, however, his views on the absolute authority of kings and had not forgiven the party of Gloucester for their persecution of his former supporters. In 1387 Gloucester, Arundel and Warwick were seized, and a packed and intimidated Parliament condemned the three to death. Arundel was executed, and Warwick imprisoned. Before sentence could be carried out on Gloucester, news of his death came; that death was probably a violent one. The earls of Derby and Nottingham were spared and raised to the dignities of Duke of Hereford and of Norfolk. Extensive powers were surrendered by Parliament to the king and his triumph was complete. A quarrel between Hereford and Norfolk led to their banishment from England in 1388 and on the death of Hereford's father, John of Gaunt, Richard seized the Lancastrian estates. In May he went to Ireland for the settlement of the affairs of that country and Hereford seized the opportunity of invading England, ostensibly for the purpose of recovering his estates. When Richard landed in England in August, he found himself abandoned by his followers and Henry of Lancaster in possession of power. On 19 August he gave himself up to Henry at Flint in Wales. He was brought to London and on 29 September resigned the crown in favor of Henry, who, on the following day, took the royal title with the consent of Parliament. Richard was sentenced to strict imprisonment and was removed to Henry's castle of Pontefract. There he died, probably by violence, though his body was publicly exposed to refute the charge. Richard was a patron of Chaucer and Gower and was favorably inclined to the teachings of Wyclif. Consult Wallon, ‹Richard II,› (1864); Stubbs, ‹Constitutional History of England,› Vol. II (4th ed. 1896).

**RICHARD III**, king of England: b. Fothering Castle in Northamptonshire, 2 Oct. 1452; d. Bosworth, Leicestershire, 22 Aug. 1485. He was the youngest son of Richard, Duke of York, and upon the accession of his brother to the throne as Edward IV, he was created Duke of Gloucester and received the grant of extensive lands with the office of admiral. With Edward he fled to Holland in 1470, and with him returned in the following year, commanding the Yorkist vanguard against the Lancastrian forces at Barnet and Tewkesbury, where he distinguished himself by his courage and skill. There, too, he gave signs of his innate ferocity, by his execution of the Lancastrian commander Somerset and others. The murders of Edward, Prince of Wales, after Tewkesbury, and that of Henry VI, in the Tower, are also ascribed to him. Richard became grand-chamberlain of England, and, marrying Anne, the younger daughter of Warwick, fell into violent disputes with his brother Clarence who was the husband of an elder daughter. The death of Clarence in 1478, for which Gloucester cannot be made directly responsible, greatly enriched the latter. In 1480 he became lieutenant-general of the north and in 1482 carried on a victorious campaign in Scotland. Edward IV died in April 1483 leaving Richard as guardian of his 13-year-old son Edward and protector of the kingdom. Richard's first move after securing possession of the king was to seize the queen-mother's relatives, who were soon after sent to execution. Lord Hastings, who at first sided with Richard but showed signs of disaffection at his ambitious schemes, was likewise put out of the way. With the aid of the Duke of Buckingham Richard began openly to work for the crown. Doubts were cast on the legitimacy of Edward IV's children and in June a subservient Parliament asked Richard to assume the crown. This he did 26 June, though the coronation did not take place till 6 July. Soon after the young sons of Edward IV were done to death in prison. Buckingham now began to plot against Richard and in October stirred up an insurrection in Wales and the southern counties, but the movement collapsed and Buckingham was sent to the scaffold (2 Nov. 1483). More than a year of peace followed during which Richard acquired much popularity by his wise legislative measures and energetic administration. Early in August 1485, Henry, Earl of Richmond, Lancastrian claimant for the throne, landed in England, and Richard going to meet him was defeated and slain at Bosworth Field, after a display of heroic valor. The popular conception of him as a dwarf and hunchback rests on no good authority. Undeniably he was a man of fine powers and bid fair to become one of England's ablest rulers; undeniable, too, however, are his ruthless ferocity and total lack of moral consciousness. Consult ‹Letters and Papers of the Reigns of Richard III and Henry VI,› edited by Gairdner (Rolls Series 1861–63); Fabyan, ‹The New Chronicles of England and France› (1811); Walpole, ‹Historic Doubts on the Life and Reign of Richard III,› (1768); Legge, ‹The Unpopular King: Life of Richard III› (1835); Jesse, ‹Memoirs of Richard III› (1862); *English Historical Review,* Vol. V (1891); Gairdner, ‹Life and Reign of Richard III› (1898).

**RICHARD DE BURY.** See AUNGERVILLE, RICHARD.

**RICHARD CARVEL,** a historical novel by Winston Churchill, published in 1900. It is a story of the Revolutionary period and the hero, Richard Carvel, spends his early life in Maryland, where he is brought up by his grandfather, an ardent supporter of King George. The climax of the story is reached in a brilliant description of the victory of the *Bon Homme Richard* over the *Serapis,* in which battle Carvel is severely wounded.

**RICHARD OF CIRENCESTER,** sĭs'ĕ-tėr, English chronicler of the 14th century. All that is known of his life is that he entered the Benedictine monastery of Saint Peter's, Westminster, and was there in 1350; that in 1391 he obtained permission from his abbot to make a visit to Jerusalem; and that he died in his monastery in 1400 or 1401. He is the author of ‹Speculum Historiale de Gestis Regum Angliæ,› a compilation from other chronicles, giving an account of the kings of England from 447 to 1066. His name is best known, however, in connection with a forgery of the 18th century. In 1747 Charles Bertram, an English teacher in Copenhagen, wrote to the well-known English antiquary, Stukeley, that a friend of his had a manuscript work on Roman Britain, by a monk named Richard of Westminster, and a transcript of the manuscript was subsequently forwarded, with a few lines in facsimile. The author was soon identified with Richard of Cirencester, who henceforth passed for the writer of a valuable Latin treatise, ‹De Situ Britanniæ.› The work was published in Copenhagen in 1757 and passed as authentic until B. B. Woodward, librarian of Windsor Castle, exposed the forgery in 1866.

**RICHARD PLANTAGENET,** plăn-tăj'ĕ-nĕt, EARL OF CORNWALL, titular emperor of Germany, younger son of King John of England: b. Winchester, Hampshire, 5 Jan. 1209; d. Kirkham, Lancashire, 2 April 1272. He fought against France, in the army of his brother Henry III, went on a crusade to Palestine, and on his return to England in 1242 again assisted his brother in a war against France, but was soon after deprived of his French domain Guienne. In 1256 he was chosen emperor of Germany by a faction while the opposing party declared Alfonso X emperor. He was crowned king of the Romans in 1257, but was unable to obtain general recognition though he exercised all the rights of a sovereign. In 1264 he returned to England to assist his brother and was taken prisoner at the battle of Lewes, 13 May 1264. He returned to Germany in 1268, held a diet at Worms in 1269, after which he returned to England. He was one of the ablest and wealthiest princes of his day. Consult Lorenz, ‹Deutsche im 13. und 14. Jahrhundert› (1863–67); Schirrmacher, ‹Die letzten Hohenstauffen› (1871); Koch, ‹Richard von Cornwall 1209–57› (1888).

**RICHARD ROE.** See DOE, JOHN.

**RICHARDS,** rĭch'ạrdz, **Charles Brinckerhoff,** American engineer: b. Brooklyn, N. Y., 23 Dec. 1833; d. 20 April 1919. He was educated privately, and for many years was superintendent of the Colt's Arms Company at Hartford. He occupied a similar post with the Southwark Foundry and Machine Company at Philadelphia in 1880–84, was consulting engineer for numerous public buildings and after 1884 filled the chair of mechanical engineering at Yale. He invented in 1861 the indicator for steam-engines, which bears his name; was one of the United States expert commissioners at the Paris Exposition in 1889, and prepared a large share of their official report; and was a member of various American and European scientific societies. He was editor of engineering and technical terms in Webster's ‹International Dictionary.›

**RICHARDS, Ellen Henrietta Swallow,** American chemist and educator: b. Dunstable, Mass., 3 Dec. 1842. She was graduated from Vassar in 1870, from the Massachusetts Institute of Technology in 1873, and in 1875 was married to Robert Hallowell Richards. She has been an instructor at the Massachusetts Institute of Technology since 1876, is chemist of the Manufacturers' Mutual Fire Insurance Company, and is also a specialist in water analysis. She has published ‹Chemistry of Cooking and Cleaning› (1882); ‹The Cost of Living› (1899); ‹Air, Water and Food› (1900), etc.

**RICHARDS, Herbert Maule,** American botanist, brother of Theodore William Richards (q.v.): b. Germantown, Pa., 6 Oct. 1871. He was educated at Harvard and Leipzig, and later traveled in Java, Japan, China, Straits Settlements and the Malay Archipelago. After occupying different positions at Harvard, Radcliffe, Columbia and Barnard he became professor of botany at Barnard in 1906. He has specialized in plant physiology.

**RICHARDS, John Morgan,** American author: b. Aurora, N. Y., 16 Feb. 1841; d. 11 Aug. 1918. He was educated in the public schools and early entered business life. He was connected with different commercial interests in the United States until 1867, when he took up his residence in England. He was chairman of the firm John Morgan Richards and Sons, London; and in 1888–1905 was owner of *The Academy*. Author of ‹With John Bull and Jonathan, Sixty Years of an American's Life in England and the United States› (1905); ‹The Life and Letters of Mrs. Craigie (John Oliver Hobbes)› (1911); ‹Almost Fairyland› (1914).

**RICHARDS, Joseph William,** American metallurgist: b. Oldbury, England, 28 July 1864; d. Bethlehem, Pa., 12 Oct. 1921. Educated at the Central High School, Philadelphia; Lehigh University, and at Heidelberg and Freiberg. He was connected with the faculty of Lehigh University from 1887, and after 1903 was professor of metallurgy there. He was professor of electro-chemistry at Franklin Institute, Philadelphia, in 1907–10; and from 1915–18 was a member of the United States Navy Consulting Board. Author of ‹Aluminium› (1887; 3d ed., 1895); ‹Metallurgical Calculations: Part I, General Metallurgy; Part II, Iron and Steel; Part III, Non-ferrous Metals› (1907–08), etc.

**RICHARDS, Laura Elizabeth Howe,** American writer of juvenile fiction: b. Boston, 1850. She is a daughter of Mrs. Julia Ward Howe (q.v.), and was married in 1871 to Henry Richards of Gardiner, Me., where she has since resided. Among her numerous popular works are ‹The Joyous Story of Toto› (1885); ‹Queen Hildegarde› (1889); ‹Captain January› (1890); ‹Melody› (1893); ‹When I Was Your Age› (1893); ‹Three Margarets› (1897); ‹Snow White› (1900); ‹The Green Satin Gown› (1903); ‹The Merryweathers› (1904); ‹Letters and Journals of Samuel Gridley Howe› (2 vols., 1906–09); ‹The Wooing of Calvin Parks› (1908); ‹Florence Nightingale› (1909); ‹Aboard the Mary Sands› (1911); ‹Two Noble Lives› autobiographical of her father and mother (1911); ‹The Little Master› (1913); ‹Three Minute Stories› (1914); and with her sister Maude Howe Elliott, ‹Julia Ward Howe› (1915).

**RICHARDS, Robert Hallowell,** American mining engineer: b. Gardiner, Me., 26 Aug. 1844. He was graduated at the Massachusetts Institute of Technology in 1868, and was connected with the faculty of that institution from 1868, becoming professor of mineralogy and assaying in 1871; professor of mining engineering in 1873; and emeritus professor in 1914. He invented a jet aspirator for chemical and physical laboratories in 1873; a prism for stadia surveying in 1890; and several ore separators for copper and iron ores. Author of ‹Ore Dressing› (4 vols., 1903–09); ‹Ore Dressing,› textbook (1909).

**RICHARDS, Theodore William,** American chemist: b. Germantown, Pa., 31 Jan. 1868. He was educated at Haverford College, Harvard, Göttingen, Leipzig and Dresden. He was a member of the faculty at Harvard from 1894, becoming professor of chemistry in 1901, and director of Gibbs Memorial Laboratory in 1912. He was exchange professor from Harvard to Berlin in 1907, and adviser of the Carnegie Institute Research Association from 1902. He has specialized in atomic weights and in physical and inorganic chemistry. He was Nobel laureate in chemistry in 1914.

**RICHARDS, Thomas Addison,** author and artist: b. London, 3 Dec. 1820; d. Annapolis, 29 June 1900. He came to the United States in 1831 and settled in Georgia. He studied art at the National Academy in New York with Daniel Huntington, and at an early age began writing and illustrating for publication. He organized the Woman's School of Design at Cooper Union in 1859 and was its first director. In 1868 he became professor of art in the University of the City of New York and after 25 years' service was made professor emeritus. He was a constant exhibitor at the National Academy of Design, became an associate in 1848, an academician in 1851, and was member of the council and corresponding secretary 1852–92. In the early 50's he was a frequent contributor of pictures and text to *Harper's Magazine*, describing in his articles scenes in the United States and the homes of American authors. His landscape paintings produced in many parts of the United States and Europe are illustrative rather than creative. He was the author and illustrator of ‹The American Artist› (1848); ‹Georgia Illustrated› (1851); ‹Romance of American Landscape›; ‹Summer Stories of the South›; ‹Pictures and Painters.›

**RICHARDS, William,** American missionary and Hawaiian diplomat: b. Plainfield, Mass., 22 Aug. 1792; d. Honolulu, 7 Dec. 1847. He was graduated at Williams College in 1819 and at Andover Theological Seminary in 1822. He was then ordained and in November 1822 started on his journey to the Hawaiian Islands where he became a missionary. His work was highly successful, but in 1838 he resigned his missionary duties in order to become councilor, chaplain and interpreter to the Hawaiian king. He was special Ambassador to England on a mission to secure recognition of the independence of the islands by foreign powers, and after the successful conclusion of his errand he returned to Honolulu and from 1845 until his death he was Minister of Public Instruction.

**RICHARDS, Sir William Buell,** Canadian jurist: b. Brockville, Ontario, 2 May 1815; d. Ottawa, 26 Jan. 1889. He was admitted to the bar in 1837 and practised law at Brockville. In 1848 he was elected to the Canadian Parliament, and in 1851 was appointed a member of the Executive Council. He was appointed queen's counsel in 1850, and in 1853 became puisné judge of the Court of Common Pleas, Ontario, receiving the office of chief justice of that court in 1863, and that of chief justice of Ontario in 1868. He was chief justice of the

Supreme Court of Canada in 1875–79, and then retired. He was knighted in 1878.

**RICHARDS, William Trost,** American artist: b. Philadelphia, 14 Nov. 1833; d. Newport, R. I., 8 Nov. 1905. He first studied under Paul Weber and in 1855 went abroad for observation and study in Italy and Paris, establishing a studio in Philadelphia in 1856. In his landscapes he adopted the minute method of drawing characteristic of the English Pre-Raphaelites, though he resembled them in no other respect, his subjects being transcripts rather than composed pieces. His greatest success was in his marines where he carefully studied the motion of waves in storm and calm. He painted numerous subjects along the Atlantic Coast, especially near Newport, where he later lived. He exhibited at the Royal Academy, London, at the Paris Salon and the various American expositions. He was a member of the National Academy of Design. A series of his water-color marines hangs in the Metropolitan Museum, New York.

**RICHARDSON, Sir Benjamin Ward,** English physician: b. Somerby, Leicestershire, 31 Oct. 1828; d. London, 21 Nov. 1896. He was educated at Anderson College, Glasgow and Saint Andrews University, and in 1855 removed to London and for three years was lecturer on medical jurisprudence at the School of Medicine in Grosvenor Place, and until 1865 lecturer on physiology. Sanitary reform and methods of producing anæsthesia were the two fields in which he was especially interested. Of the 14 anæsthetics that he brought into use methylene bichloride is most widely known. He introduced the ether spray for local anæsthesia, and the lethal chamber for the humane extinction of the life of animals. He also discovered the properties of amyl nitrite and introduced a number of bromides and other substances into use by the medical profession. He was a strong advocate of total abstinence from the use of alcohol, on the ground that its power as a drug required the greatest caution in its use. Aside from his scientific writing he produced biographies, plays and poems. The ‹Asclepiad,› a series of original researches in the science, art and literature of medicine, was written entirely by himself and appeared quarterly from 1884 to 1895. Besides works already mentioned he wrote ‹Diseases of Modern Life› (1876); ‹National Health› (1890), etc.

**RICHARDSON, Charles Francis,** American educator: b. Hallowell, Me., 29 May 1851. He was graduated at Dartmouth in 1871, was editor of the New York *Independent* in 1872–78, of the Philadelphia *Sunday School Times* in 1878–80, and of *Good Literature*, New York, in 1880–82. Since 1882 he has occupied the chair of English at Dartmouth. He has published ‹A Primer of American Literature› (1878); ‹The Cross,› poems (1879); ‹The Choice of Books› (1881); ‹American Literature 1607–1885› (1886–88); ‹The End of the Beginning› (1896), etc.

**RICHARDSON, Clifford,** American chemical engineer: b. Worcester, Mass., 6 March 1856. He was graduated at Harvard in 1877, and was a member of the United States Geological Survey in 1878. In 1878–87 he was assistant chemist in the United States Department of Agriculture. He was superintendent of tests for the Barber Asphalt Paving Company in 1896–1900, and owner of the New York Testing Laboratory in 1900–10. He is an expert in asphalt, bitumen and Portland cement. Author of ‹On American Cereals› (1883, 1884, 1886); ‹On the Nature and Origin of Asphalt› (1898); ‹The Modern Asphalt Pavement› (1905; 2d ed., 1908), etc.

**RICHARDSON, Ernest Cushing,** American librarian: b. Woburn, Mass., 9 Feb. 1860. He was graduated at Amherst in 1880 and at Hartford Theological Seminary. In 1883–90 he was professor and librarian at the latter institution and since 1890 has been librarian at Princeton. He was American editor of Berner's ‹Jahresberichte d. Geschichtswissenschaft›; critical editor of ‹Hieronymus w. Gennadius de Viris Illustribus› (1896); and wrote ‹Biographical Synopsis of the Ante-Nicene Fathers› (1887); ‹Classifications, Theoretical and Practical› (1901).

**RICHARDSON, Henry Hobson,** American architect: b. Parish of Saint James, La., 29 Sept. 1838; d. Boston, 27 April 1886. He was graduated at Harvard in 1859 and in the following year went to Paris and entered the Ecole des Beaux Arts. Throughout his student life in Paris he worked under the instruction of L. J. André, and when his private fortune was swept away by the Civil War he secured through André's friendship an appointment in a government office in Paris. In 1865 he returned to the United States and located his business in New York. His first commission, received in October 1866, was for building the Church of the Unity in Springfield, Mass. The design of this church is the only instance of his following Gothic models; and this, which may in general terms be typical of the English Rural Gothic, yet presents certain independent features that show the practical bent of his mind. Shortly afterward he built the Boston and Albany Railroad office in the same city and Grace Church in West Medford. In October 1867 he formed a partnership with Charles Gambrill which lasted until October 1878. The works of this period, which include several of his more important ones, and especially Trinity Church in Boston, were projected under the firm name, though with few exceptions were the conceptions of Richardson. In 1870 the commission was received to build the Brattle Street Church in Boston and the design he produced, Romanesque in general character, may be regarded, however, as rather transitional to that style that he worked in so consistently in the latter part of his life, and which received its first confirmation in the North Church of Springfield, built by him in 1872. The Brattle Street Church, now known as the First Baptist Church, has a fine tower ornamented below the upper arcade by a bold sculptured frieze. The church itself is ineffective in respect to the relations of its general masses with this superb tower, and, its acoustic properties being imperfect, the work is judged a partial failure.

Trinity Church in Boston was begun in 1872 and finished in 1877. This church shows the perfection of his individual style evolved from his study of the Romanesque churches of southern France. It is cruciform in plan, but its distance from apse-wall to façade is only about 39 feet in excess of the distance between the two walls of the transepts. This innovation in church architecture has had a powerful effect upon subsequent designs. After Trinity he produced only two other, and these comparatively unimportant churches, though he entered the competition for the Cathedral Church at Albany. His subsequent work was in the designing of municipal or commercial structures, and of these the one by which he wished to be judged was the Allegheny County buildings — courthouse and jail, of Pittsburgh, Pa. These structures, however, he did not live to see completed. Other buildings designed by him are Sever Hall, and the Law School of Harvard University; the city hall at Albany; parts of the New York State capitol at Albany, in which he was associated with Leopold Eidlitz and Frederick Law Olmsted, his individual work being the senate chamber, the governor's room, the Court of Appeals chamber and the western staircase; the chamber of commerce at Cincinnati and the Field building at Chicago. Other buildings such as stores, railway stations, public libraries and private dwellings were designed by him. Consult Van Rensselaer, ‹Henry Hobson Richardson and His Works› (1888).

**RICHARDSON, Sir John,** Scottish naturalist and Arctic explorer: b. Dumfries, Scotland, 5 Nov. 1787; d. Lancrigg, near Grasmere, Scotland, 5 June 1865. He was educated at the University of Edinburgh and in 1807 entered the navy as assistant surgeon. In 1819 he was appointed surgeon and naturalist to Sir John Franklin's expedition to Hudson Bay and the Coppermine River. He was appointed surgeon of the Royal Marines at Chatham in 1824, but accompanied Franklin on his second Arctic expedition in 1825, resuming his duties at Chatham in 1827. He was knighted in 1846 and in 1848 set out with Rae in search of Franklin. The search was fruitless so far as finding trace of Franklin, but Richardson gained valuable information concerning the physical conditions of North America. In 1855 he resigned his position as surgeon to the Hasler Hospital at Gosport, which he had held since 1838. He was author of the articles «Ichthyology» and «Franklin» for the ‹Encyclopedia Britannica›; Vols. I and III of ‹Fauna Boreali-Americana›; and also published ‹A Voyage Through Rupert's Land and the Arctic Sea› (1851); ‹The Polar Region› (1861), etc.

**RICHARDSON, John,** Canadian author: b. near Niagara Falls, Ontario, 1797; d. United States, about 1863. He served in the Canadian militia in the War of 1812, and later entered the British army, taking part in actions in Spain and attaining the rank of major. He returned to Canada in 1838 and founded *The New Era* at Brockville, Ontario, in 1840. He removed to Kingston in 1843 and established *The Native Canadian* there, continuing its publication until 1845. He also served for a time as special correspondent for the London *Times*. He removed to the United States after 1845 and was there engaged in journalism until his death. Author of ‹Wacusta› (1832); ‹Eight Years in Canada› (1847); ‹The Guards in Canada› (1848); ‹The Monk Knight of Saint John› (1850); ‹Wau-nan-gee› (1852), etc.

**RICHARDSON, Maurice Howe,** American surgeon: b. Athol, Mass., 31 Dec. 1851; d. 31 July 1912. He was graduated at Harvard in 1873 and took his M.D. there in 1877. He was engaged in the practice of surgery at Boston from 1876 until his death, and attained a foremost place among American surgeons. He was a member of the medical faculty at Harvard from 1879, and was visiting surgeon to the Massachusetts Hospital from 1886. He contributed to Parks' ‹Surgery by American Authors›; and to Dennis' ‹System of Surgery.›

**RICHARDSON, Owen Williams,** American physicist: b. Dewsbury, England, 26 April 1879. He was educated at the universities of Cambridge and London, and was a fellow of Trinity College, Cambridge, in 1902–08. In 1906–13 he was professor of physics at Princeton University, and since 1913 has occupied that chair at King's College, London. Author of ‹Electron Theory of Matter› (1914); ‹Emission of Electricity from Hot Bodies› (1916).

**RICHARDSON, Rufus Byam,** American archæologist: b. Westford, Mass., 18 April 1845. He was graduated at Yale in 1869, studied divinity at Yale 1869–72, and at Berlin 1872–74. He was professor of Greek at the University of Indiana 1880–82, and at Dartmouth 1882–93, and since 1893 has been director of the American School of Classical Studies at Athens, Greece. He edited Æschines' ‹Oration Against Ctesiphon› (1889); and contributed frequently to the ‹American Journal of Archæology› (1892–1902). He wrote ‹Vacation Days in Greece› (1903).

**RICHARDSON, Samuel,** English novelist: b. Derbyshire, 1689; d. Parson's Green, near London, 4 July 1761. Up to the age of 50 the life of Richardson was not only uneventful, but undistinguished. The son of a joiner of the better class, who had moved from London owing to circumstances vaguely connected with Monmouth's rebellion, there is no clear evidence that he ever had more than what he calls «common school learning.» His father's means did not permit him to take orders, but as a concession to an early taste for reading, he was, when the family returned to the metropolis, apprenticed to John Wilde, an Aldersgate street printer. Here he exhibited the usual traits of the exemplary apprentice; proceeded, in due course, compositor, corrector, overseer, and master; and, as in duty bound, eventually married his employer's daughter. From Fleet street, where he first began business, he moved to Salisbury Court (now square); set up newspapers and books; worked on the publications of the Society for the Encouragement of Learning; and advanced generally in an industrious career. His first wife dying in 1731, he married again, his second wife being the sister of James Leake, a Bath bookseller. Children were born to him by both his wives; but he was well past middle life before he had acquired any literary reputation, although he had long been known to his friends as what Goldsmith calls «a dab at an index,» a clever compiler of opportune prefaces and «honest dedications,» and, above all, a copious and indefatigable letter-writer.

This, from his childhood, had been his hobby. As a boy he was the chartered secretary of all the love-sick girls in the neighborhood; as a printer's apprentice he had corresponded voluminously with a gentleman who was a «master of the epistolary style»; and it is characteristic of the qualities he afterward developed as a novelist, that his communications were always of the moral or improving order. Out of these things arose his first literary effort. Two bookseller friends, Rivington and Osborn, suggested to him the preparation of a model letter-writer. Richardson at once went farther by proposing that the letters should teach those concerned to think as well as write. Such was the origin of the little-known volume of 'Familiar Letters' issued in January 1741. Before it was finished, one of the model epistles, coupled with the recollection of something he had heard some 20 years before, led him to the composition of a story, also in letters, dealing with the triumphs of chastity in humble life. The idea rapidly grew into the famous 'Pamela; or, Virtue Rewarded' (1740), which not only obtained an immediate and unexampled success, but by superadding to the patient realism of Defoe a power of minute mental analysis which Defoe did not possess, set a new fashion in fiction. It is this latter quality, together with the transfer of the fable from the impossible land of heroic romance to the very probable region of ordinary life, which gives the Salisbury Court printer his claim to have invented the novel of sentimental analysis as opposed to the novel of manners. Despite the moral professions of 'Pamela' many of its scenes are needlessly indelicate; and the final union of the heroine to the man who has repeatedly attempted her ruin is unpleasant,— to say nothing of the fact that there is a sordid air of calculation about the virtue she so vigilantly preserves. But dealing, as the story did, with real people in a real way, in what was, moreover, a dead season of letters, the book's success is not surprising. Fine ladies raved about it in public places. Clergymen praised it from the pulpit. Pope, sincerely or insincerely, declared it «would do more good than many volumes of sermons,» and the voices of the continuer and parodist were speedily heard in the land.

Of the inevitable sequel, 'Pamela's Conduct in High Life,' by John Kelly of the *Universal Spectator,* nothing need be said, save that it forced Richardson upon a continuation of his own, now deservedly neglected. But among the numerous publications prompted by 'Pamela's' more assailable side, two in particular require to be mentioned. One was 'An Apology for the Life of Mrs. Shamela Andrews,' a clever but very gross attack upon the inner morality of the heroine. Richardson himself attributed this to Fielding, as did other of his contemporaries; but Fielding is never known to have acknowledged it. Ten months later Fielding issued 'Joseph Andrews,' which at all events set out with the open intention of burlesquing Richardson, although its writer promptly abandoned this inadequate motive with the development of more important characters than Pamela Booby, a name which, both in 'Shamela' and 'Joseph Andrews,' is cruelly filled in from Richardson's hero, «Mr. B.» Either of these performances was sufficient to be a thorn in the side of 'Pamela's' sensitive author. But probably the worst thorn of all was the success of Fielding's 'Tom Jones,' which appeared not long after Richardson's next novel 'Clarissa.'

'Clarissa; or the History of a Young Lady,' usually misnamed 'Clarissa Harlowe,' was published in 1747–48, in seven volumes and three instalments. The story, which deals with the «Distresses that may attend the Misconduct both of Parents and Children in Relation to Marriage,» is an intensely tragic one. The heroine, a very pure and beautiful woman, is deliberately hunted down by a relentless seducer, whose eventual death at the hand of her guardian only faintly satisfies poetical justice. But in this book Richardson rises to the height of his powers. Encumbered by a story to be told in letters, and trammeled with his own prolixity, he nevertheless contrives to hold his readers fascinated, not only with the fortunes of his heroine but with the individuality of her despicable but dazzling pursuer, who is drawn with surpassing dexterity. The intermittent mode of publication added flame to the public interest in the issue; and the writer was bombarded with appeals for a «happy ending.» As to this, he showed more artistic fortitude than might have been expected. Imperfect as his education had been, he had learned from the *Spectator* that to «make virtue and innocence happy and successful» was to defeat one of the great ends of tragedy, «the raising of commiseration and terror in the minds of the audience.» So Clarissa Harlowe dies elaborately of a broken heart; and her history remains a masterpiece.

By this time Richardson was nearing 60, and might reasonably have held his hand. But the welcome accorded to Fielding's 'Tom Jones,' coupled with the importunities of his coterie of lady friends, soon engaged him in a third effort, the object of which was to delineate a model good man and fine gentleman combined. This was the 'History of Sir Charles Grandison' (1753–54), a book which still has its admirers, though it does not by any means attain the tragic level of 'Clarissa.' That the hero of such a work should be something of a prig is inevitable: but he has many estimable qualities which are not ridiculous; and he is surrounded by a bevy of female worshippers who are drawn with unquestionable skill. Neither Clementina nor Harriet Byron could have been conceived by an inferior artist. It is easy to make fun of the little printer's superexcellent central figure; but there must, in spite of his long-windedness, have been something in the personage who could attract the admiration of both Ruskin and the Master of Balliol.

Beyond a very popular paper in Johnson's *Rambler,* Richardson wrote nothing more of importance. He continued to prosper in his business, made money, became Master of the Stationers' Company, and eventually Law Printer to the king. He was a nervous, inoffensive, sensitive valetudinarian, delighting in the stimulus of feminine adulation rather than in the robust criticism of his own sex. His style is hopelessly pedestrian and diffuse; but it has an extraordinary cumulative power which attracts, and by degrees detains, the persevering reader. His faculty of minute imagination is wonderful; and he gradually acquired an extraordinary insight into the workings of the female heart. The English fiction which followed developed itself on somewhat different lines; but it is impossible to deny to him the credit of inaugurating the novel of sentimental analysis, which for a time became the fashion, even more in France and Germany than in England. See CLARISSA HARLOWE.

**Bibliography.**— Richardson's life has been written by Mrs. A. L. Barbauld, ‘Memoir’ prefixed to ‘Correspondence’ (6 vols., 1804); by Miss C. L. Thomson (1900), and by Austin Dobson, ‘English Men of Letters’ (1902). Consult also Scott's ‘Lives of the Novelists’ (1825); Mrs. Oliphant, *Blackwood's Magazine* (March 1869); H. D. Traill, *Contemporary Review* (October 1883), and Texte's ‘Jean Jacques Rousseau,’ etc. (1895). There are editions of his novels by Rev. E. Mangin (1811); Sir Leslie Stephen (1883); Mrs. McKenna (1901), and Prof. W. L. Phelps of Yale. There are several portraits of Richardson by the painter Joseph Highmore.

AUSTIN DOBSON,
*Author of ‘Life of Richardson,’ etc.*

**RICHARDSON, Tobias Gibson,** American surgeon: b. Louisville, Ky., 1827; d. 1892. He took his M.D. at the University of Louisiana in 1848 and later occupied the chairs of anatomy and surgery there. He practised for a time in Philadelphia, where he was a member of the College of Physicians and of the American Surgical Association. In 1851, before the use of anæsthetics and antiseptics, he successfully extirpated the thyroid gland, the first successful case recorded. He occupied the chair of surgery at Tulane University, New Orleans, in 1858–92; and in 1878 was president of the American Medical Association. He wrote many articles and reports for scientific journals and for the ‘Transactions’ of the American Medical Association and the American Surgical Association, and was author of ‘The Elements of Human Anatomy’ (1854).

**RICHARDSON, William Adams,** American jurist: b. Tyngsboro, Mass., 2 Nov. 1821; d. Washington, D. C., 19 Oct. 1896. He was graduated at Harvard in 1843, later studied law there and in 1846 was admitted to the bar. He was appointed judge-advocate and governor's aide in Massachusetts; and in 1855 revised the statutes of the State, afterward editing the annual supplements of the general statutes until 1877. He was named judge of probate in 1856, and also judge of insolvency in 1858–72. He became Assistant Secretary of the United States Treasury in 1869 and Secretary in 1873. He resigned in 1874 to accept an appointment as justice of the United States Court of Claims, of which he was chief justice in 1885–96. He was lecturer and professor in the Georgetown Law School, District of Columbia. Author of ‘The Banking Laws of Massachusetts’ (1855); ‘Practical Information Concerning the Debt of the United States’ (1872); ‘History of the Court of Claims’ (1882–85), etc.

**RICHELIEU, Armand Jean du Plessis de,** ăr-män zhŏn dü plĕs-sē rēsh-lē-e, Eng. rēsh'loo, **Cardinal**, DUC DE, French prelate and statesman: b. Paris, according to Jal, who cites a register of baptism, 9, not as usually stated, 5 Sept. 1585; d. Paris, 4 Dec. 1642. Armand was the third son; his father lost his life at the siege of Paris, 10 July 1590, and the mother was left with five children and an estate heavily encumbered with debt. By practising careful economies she liquidated the debt and brought up the children as befitted their rank. In 1594 the future cardinal entered the Collège de Navarre, Paris, where he made a brilliant course in grammar and philosophy. He next entered a «finishing school» in preparation for the life of a courtier and where his training was directed toward a military career. This career was cut short when Alphonse, his elder brother, refused the bishopric of Luçon, preferment to which had been vested in the Richelieu family by Henry III. Armand was thereupon induced to enter the Church. At 21, in 1606, Henry IV nominated him bishop of Luçon. He obtained from the Pope a dispensation allowing him to accept the office though under age, and on 16 April 1607 was consecrated by the Cardinal de Givry in presence of the Pope himself (Paul V). For several years he devoted himself to the duties of his see, reforming abuses and laboring for the conversion of Protestants. But his ambition always made him turn his eyes toward the court, and having come to Paris in 1614 as deputy of the clergy of Poitou to the States-General he managed to insinuate himself into the favor of the queen-mother, who obtained for him the post of grand-almoner, and in 1616 that of Secretary of State for War and Foreign Affairs. On the disgrace of the queen-mother (1617) Richelieu fell with her, and was banished first to Blois and then to Avignon. In 1620 he managed to effect a reconciliation between Mary of Medici and her son, Louis XIII. On 5 Sept. 1622 he obtained through her influence the cardinal's hat, and on 19 April 1624 was admitted into the Council of State. No sooner was Richelieu secure in his high post than he began systematically to extend the power of the Crown by crushing the Huguenots and overthrowing the privileges of the great vassals, and to increase the influence of the French monarchy by undermining that of the Hapsburgs, both beyond the Pyrenees and in Germany. Louis XIII, sensible of the energy of his Minister, favored his plans, though he always showed a dislike for the man, whom he would gladly have destroyed had he been able to govern without him. The Huguenots had for a long time resisted the royal power; and bloody insurrections, in several preceding reigns, had arisen from their struggles in their attempts to gain political and religious power. The wisdom and mildness of Henry IV had, indeed, assuaged the excitement of the contending parties, but his reign was too short to extinguish the fires. Richelieu resolved to crush the weaker by the aid of the stronger party, and thus to deprive those who should be disposed to resist his schemes of their main prop. The rallying-point of the Huguenots was Rochelle; and Richelieu neglected no means to make himself master of that city. In the celebrated siege of Rochelle he commanded the army in person.

Rochelle, supported by England, from which it continually received supplies, held out for a long time against all the efforts of the cardinal; and the hope of reducing it was already nearly abandoned, when Richelieu, by the erection of an immense mole, cut off the communication by sea, and finally compelled it to surrender by famine (1628). It would be a mistake to see in this war that Richelieu waged against the Huguenots an example of religious intolerance, for although this would have been quite in keeping with the spirit of his time, Richelieu was, with respect to this matter, in advance of his age. He destroyed the political consequence of the Huguenots as a separate body within the state, but by the Peace of Alais or Edict of Grace, which concluded the war (June 1629), he left them liberty of worship and equality of civil rights, and throughout his ministry employed them, with other citizens, in the army, the magistracy and offices connected with the revenue. During the continuance of this war Richelieu had taken various steps in pursuance of the other main end of his internal policy, the overthrow of the power of the great nobles. In 1626 he ordered the demolition of all those feudal fortresses which could not be used for the defense of the frontiers, and which were a perpetual menace to the Crown. The next step was the removal from court of the queen-mother who had become hostile and endeavored to obtain Richelieu's downfall. Saint Simon represented to the king the services of Richelieu and the impossibility of dispensing with his aid. Louis, therefore, ordered him to Versailles, and assigned him apartments in the palace directly below his own. This day (10 Nov. 1630), on which the hopes of the queen and of the cardinal's enemies were disappointed, was called the «Day of the Dupes» («la Journée des Dupes»). The queen-mother was banished to Compiègne, her friends removed from place and some of them thrown into the Bastile. This step, and the almost total annihilation of the privileges of the parliaments and the clergy, excited all classes against the despotic administration of the cardinal, and the discontent broke out in numerous risings and conspiracies, which, however, were not only suppressed by the prudence and vigor of his measures, but also contributed to the furtherance of his plans, and gradually rendered the royal power entirely absolute. In 1632 the royal arms, directed by Richelieu (in the previous year raised to the rank of duke), suppressed the rising in favor of the Duke of Orleans, the king's brother, to which the Duke of Montmorency had been induced to lend his support. Even those whom the king privately favored were obliged to yield to the all-powerful Minister, and paid with their lives for their rashness in venturing to oppose him, as in the instance of Cinq-Mars, who in 1642 had entered into a conspiracy against him, which the king was, not without reason, believed to have favored. While the Minister was thus extending the power of the Crown at home he did not neglect the aggrandizement of the monarchy abroad. The Thirty Years' War gave him an opportunity of effecting this object. The same man who pursued, with the greatest severity, the Protestants in France, employed all the arts of negotiation, and even force of arms, to protect the same sect in Germany, for the purpose of humbling the house of Austria. In the early stages of the war he subsidized Count Mansfield. Subsequently Gustavus Adolphus, king of Sweden, the great bulwark of religious liberty in Germany, received aid of every kind from Richelieu as long as he was not in danger of becoming formidable to France; but when the brilliant victories of Gustavus gave the cardinal reason to consider his power as more dangerous than that of Austria he abandoned that prince in the midst of his successes. The war which he undertook against Spain, and which continued till 1659, put France in possession of Catalonia and Roussillon, and the separation of Portugal from Spain was effected by his assistance (1640).

Richelieu must be allowed to have deserved the character of a great statesman; he cannot be denied the glory of having raised the power of the sovereign in France to its highest pitch; but he was proud, arrogant and vindictive. He was a patron of letters and art, and founder of the French Academy and the Jardin des Plantes. Louis XIII died a few months after him; but in the long reign of Louis XIV the effects of Richelieu's policy were yet visible.

Richelieu was a voluminous writer; his most important works may be consulted in 'Mémoires sur la règne de Louis XIII' (in Collection Petitot, Paris 1823 et seq.); 'Mémoire d'Armand du Plessis de Richelieu, évêque de Luçon, écrit de sa main, l'année 1607 ou 1610,' edited by Baschet, A. (Paris 1880); 'Lettres, instructions, diplomatiques, etc.,' edited by Avenal, G. d' (8 vols., Paris 1853–77); 'Testament politique d'Armand du Plessis, Cardinal de Richelieu' (Amsterdam 1687). For extended biography consult Avenal, G. d', 'Richelieu et la monarchie absolue' (2d ed., 4 vols., Paris 1895); Barrière, J. F., 'Memoirs of the Duke de Richelieu' (New York 1904); Caillet, J., 'L'Administration en France sous le ministère du cardinal de Richelieu' (new ed., 2 vols., Paris 1863); Fagniez, G., 'Le père Joseph et Richelieu' (2 vols., Paris 1894); Hanoteaux, G., 'Histoire du cardinal de Richelieu' (Paris 1893); Lodge, R., 'Richelieu' (London 1896); Martineau, A., 'Le cardinal de Richelieu' (Paris 1865); Perkins, J. B., 'Richelieu and the Growth of the French Power' (New York 1900); Topin, M. J. F., 'Louis XII et Richelieu' (Paris 1885).

**RICHELIEU,** (also called **CHAMBLY, SOREL** and **SAINT JOHN**), river of Quebec, Canada, leaving Lake Champlain at its northern extremity and flowing in a direct northerly course to Saint Lawrence River, which it enters at the southern end of the widening of the river known as Lake Saint Peter. Near the centre of its course the Richelieu River widens into the basin of Chambly and it is canalized above there in order to avoid the rapids and maintain navigation from the Hudson to the Saint Lawrence. The town of Sorrel lies on its east bank as it enters Lake Saint Peter.

**RICHEPIN,** rēsh-păn, **Jean,** French poet novelist and dramatist: b. Medéah, Algeria, 4 Feb. 1849. He began the study of medicine with his father, a physician, but gave it up and entered the École Normale in the department of literature. After 1870 he engaged in journalism, editing *L'Est,* and contributing to *Mot d'Ordre,* the *Corsaire* and *Vérité,* in which latter he published 'Les étapes d'un refractaire.' Shortly afterward he published 'Chanson des Gueux,' for which he was fined and obliged to spend a month in prison, during which time he wrote ‘Morts bizarres.’ Works of this character have placed him among the most advanced of the naturalistic school; the boldness of his expression and the license of his subject have brought to him both applause and condemnation. In reply to criticism he admitted in 1881, in defense of his works, that his coarseness was perhaps unnecessary and repugnant, but not immoral. His works include verses under titles such as ‘Caresses’ (1877); ‘Blasphèmes’ (1884); La mer’ (1886); ‘Mes paradis’ (1894); of romances ‘Madame André’ (1874); ‘Sophie Monnier’ (1884); ‘Césarine’ (1888); ‘Bravesgens’ (1888), besides many others; and of dramas ‘Nina Sahib’ (1882); ‘Monsieur Scapin’ (1886); ‘Le Filibustier’ (1888); ‘Par le glaive’ (1892); ‘Vers la joie’ (1894); ‘Chemineau’ (1897). He published also a work entitled ‘Théâtre Chimérique’ (1896); in 27 acts in prose and verse.

**RICHER,** rē'shā', **Edmond,** French Roman Catholic priest: b. Chaource, Sube, 1560; d. Paris, 1631. He was educated for the Church and was a parish priest in 1590–94, when he became director of the College of Cardinal Lemoine. Soon afterward he became also syndic of the Theological Faculty of Paris. While in these positions he opposed the doctrine of the infallibility of the Pope, defending his position in ‘De Ecclesiastica et Politica Potestate’ (1611; published, 2 vols., 1629). This work brought a furious attack upon him and he was deposed from his offices. The intercession of the university saved him from imprisonment and in 1627, under pressure, he made a retraction of his arguments. He had made further explanation of his position in ‘Historia Conciliorum Generalium’ and ‘Histoire du syndicat de Richer,’ published posthumously in 1683 and 1753, respectively. He was also author of ‘Apologia pro J. Gersonio’ (1674), etc.

**RICHER, Paul,** French neurologist: b. Chartres, 17 Jan. 1849. He was educated at Paris, taking his M.D. in 1879. From its foundation in 1882 until he resigned in 1895 he was director of the laboratory of the Salpêtrière clinic of nervous diseases. He was elected to the Academy of Medicine in 1898, and was appointed professor of anatomy at the École des Beaux Arts in 1903. He is also well known for his artistic capabilities, is a draughtsman of ability and has written successfully on art topics as well as on medicine. His medical works include ‘Etudes cliniques sur la grande hystérie ou hystéro-épilepsie’ (1885); ‘Paralysies et contractures hystériques’ (1892). He collaborated with his instructor in art in writing ‘Les demoniaques dans l'art’ (1886); ‘Les difformes et les malades dans l'art’ (1889), and was sole author of ‘Anatomie artistique’ (1890); ‘Physiologie artistique de l'homme en mouvement’ (1895); ‘Nouvelle anatomie artistique du corps humain’ (1906).

**RICHET,** rē'shā', **Charles Robert,** French physiologist: b. Paris, 16 Aug. 1850. He was educated at Paris, taking his degree in medicine in 1877 and in science in 1878. He was connected with the Faculty of Medicine at Paris from 1878, and in 1887 succeeded De Béclard as professor of physiology. He was elected to the Academy of Medicine in 1899. He achieved a considerable literary reputation not only as a writer on scientific subjects but on international peace and other subjects, and he also published a volume of verse (1875) under the pseudonym Charles Epheyre. He is famous for his research into the phenomenon which he named «anaphylaxis» (q.v.), which he explained with Portier in 1902. He received the Nobel Prize in Medicine in 1913. Author of ‘Les poisons de l'intelligence’ (1877); ‘Structure des circonvolutions cerebrales’ (1878); ‘Essai de psychologie générale’ (1887); ‘Dictionnaire de physiologie’ (4 vols., 1895–1906); L'Anaphylaxie’ (1911); ‘Les Guerres et la Paix,’ etc.

**RICHFIELD,** Minn., village in Hennepin County, near Fort Snelling, and forming a suburb of Minneapolis, on the Dan Patch Electric Railroad. It has extensive greenhouses and market gardening interests. Pop. 2,673.

**RICHFIELD,** village in Utah, county-seat of Sevier County, on Denver and Rio Grande Western Railroad, 135 miles south of Salt Lake City. It was incorporated in 1878. It is the centre of an agricultural and stock-raising region. The public school system includes a high school founded in 1896; there is also an association library. Pop. (1920) 3,362.

**RICHFIELD SPRINGS,** N. Y., village in Otsego County, on the Delaware, Lackawanna and Western Railroad, about one mile from Schuyler Lake, 25 miles south by east of Utica and 13 miles north by west of Cooperstown. It is in a productive agricultural region; but the village is a well-known health resort on account of its large number of mineral springs. It is also a famous summer resort. Nearby are many places of attraction, as Otsego Lake and vicinity. It has several small manufacturing establishments which more than supply local needs. The place was settled about the middle of the 18th century, but a permanent settlement was not made until after the Revolution. It was one of the favorite localities of the Indian tribes of eastern New York. Pop. about 1,650.

**RICHFORD,** Vt, town in Franklin County, on the Missisquoi River, and on the Central Vermont and Canadian Pacific railroads, 45 miles northeast of Burlington. It was first settled in 1795 and incorporated as a village in 1878. The town is built on both sides of the river which affords good water power; the lumber interests exceed all others in importance, and there are several lumber, saw and planing mills, furniture factories, butter and dairy products, sugar evaporators, clothing manufactories, etc. It is also in a maple-sugar and agricultural region, and has a good trade, being a port of entry from Canada. The town's real estate is valued at $1,076,940 and the personal property valuation is $431,625. There are one graded and six rural schools. The government building contains the post office and custom-house; there is also the town-hall, containing library, clerk's office, public hall, lockup, etc. The customs receipts are about $100,000 annually, the expenses $12,000; the post office receipts $8,000. Pop. (1920) 1,995.

**RICHLAND CENTER,** Wis., city, county-seat of Richland County, on Pine River, and on the Chicago, Milwaukee and Saint Paul Railroad, 55 miles northwest of Madison. It was settled in 1849 and was made the county-seat in 1852. It is the centre of an agricultural, stock-raising and dairying region, and has a large export trade in flour, cheese, etc. The river furnishes water power for manufacturing, and the city contains flour and saw mills, a tannery and brick kiln. There is a public high school. Pop. (1920) 3,409.

**RICHMAN, Irving Berdine,** American lawyer and diplomat: b. Muscatine, Iowa, 27 Oct. 1861. He was graduated from the State University of Iowa in 1883 and admitted to the bar in 1885. He was elected to the lower house of the State legislature in 1889 and 1891, and was United States consul-general in Switzerland, with residence at Saint Gall, 1893–98. He has published ‹John Brown Among the Quakers and Other Sketches› (1894); ‹Appenzell; Pure Democracy and Pastoral Life in Inner Rhoden› (1895); ‹Rhode Island: Its Making and Meaning,› a historical work of much importance (1902); ‹Rhode Island, a Study in Separatism› (American Commonwealths Series, 1905); ‹California Under Spain and Mexico› (1911). Mr. Richman (Litt.D., Brown, 1904) is a member of the Iowa Historical Society, an honorary member of the Rhode Island Historical Society and a corresponding member of the Hispanic Society of America.

**RICHMOND, Charles Alexander,** American educator and Presbyterian clergyman: b. New York, 7 Jan. 1862. He was graduated at Princeton in 1883 and at the theological seminary there in 1888, being ordained in the Presbyterian ministry in 1888. He held a pastorate at East Aurora, N. Y., in 1888–94, and at Albany, N. Y., in 1894–1909. Since 1909 he has been president of Union College and chancellor of Union University. Author of ‹The Four Winds› (1902); ‹Safeguards of American Democracy› (1913).

**RICHMOND, Charles Lennox,** 3D DUKE OF, English diplomat and statesman: b. London, 22 Feb. 1735; d. Goodwood, Sussex, 29 Dec. 1806. He succeeded to the peerage on the death of his father in 1750, was appointed Ambassador Extraordinary to Paris in 1765 and in 1766 became Secretary of State under the Rockingham administration. He was strongly opposed to the policies which resulted in the American War for Independence, and in 1778 he opened the debate which demanded the withdrawal of troops from America, his opinion being that the position of the colonists was «neither treason nor rebellion, but is perfectly justifiable in every political and moral sense.» He also pursued a sympathetic course in regard to Irish affairs, advocating «an union, but not of legislature, but an union of hearts, hands, of affections and interests.» He served in Rockingham's second cabinet, and in 1784 joined Pitt's ministry. His views on Parliamentary reform were far in advance of his period, but after his affiliation with Pitt he became a Tory. He was created a Knight of the Garter in 1782.

**RICHMOND, Countess of.** See BEAUFORT, MARGARET.

**RICHMOND, Dean,** American capitalist: b. Barnard, Vt., 31 March 1804; d. New York, 27 Aug. 1866. He engaged successfully in the refining and selling of salt at 15, was a director in a Syracuse bank before he was of age and afterward engaged as a shipping and produce merchant at Buffalo. He was a leader in the movement which consolidated seven separate corporations into the New York Central Railroad Company in 1853, was its vice-president in 1853–64 and president in 1864–66. He was a recognized political leader but declined public office.

**RICHMOND, Legh,** English clergyman: b. Liverpool, 29 Jan. 1772; d. Turvey, Bedfordshire, 8 May 1827. He was graduated from Cambridge in 1794, took orders in the Church of England in 1797 and in 1798 became curate of Brading in the Isle of Wight. In 1805 he was appointed chaplain in the Lock Hospital, London, and later in the same year became rector at Turvey, where he remained until his death. He was well known as a leader in the evangelical party and wrote several tracts which were widely circulated, among them ‹The Dairyman's Daughter,› of which more than 4,000,000 copies in 19 different languages were circulated; ‹The Negro Servant,› etc. He also published ‹The Fathers of the English Church, or a Selection from the Writings of the Reformers and Early Protestant Divines of the Church of England› (8 vols., 1807–12). Consult ‹Memoirs,› by Grimshawe (1826; edited by Bedell, 1846).

**RICHMOND, SIR William Blake,** English painter: b. London, 29 Nov. 1843; d. 11 Feb. 1921. He studied in the schools of the Royal Academy, where he received two silver medals in 1857 and had his portrait of his two brothers hung at the exhibition in 1861. He traveled extensively in Italy, Greece and Egypt, studying the remains of ancient art, whence he derived many subjects for his work. From 1878 to 1883 he was Slade professor at Oxford. In 1895 he became a Royal Academician, and was professor of painting at the Royal Academy. His works include ‹The Procession of Bacchus› (1865–68); ‹The Life of Women› (1870), a series of frescoes for J. S. Hodgson of Haslemere; ‹Electra at the Tomb of Agamemnon› (1877); ‹Behold the Bridegroom Cometh› (1881); ‹Release of Prometheus› (1882); ‹Audience at Athens during the Representation of Agamemnon› (1885), now in the Birmingham Gallery. He painted portraits of Darwin, Gladstone, Browning, William Morris, Holman Hunt and Lord Lyttelton. Most notable of his works are the interior decorations and the glass mosaics of Saint Paul's Cathedral. This work was executed by a staff trained under his personal supervision. He was an earnest advocate of the development of mosaic work in England, believing that this art should be applied only in the country and under the conditions of light in which the finished product is to remain. Consult his article on Mosaics in Vol. XXXI of the New Volumes of the ‹Encyclopædia Britannica.›

**RICHMOND,** Cal., city in Costa County, 10 miles northwest of Oakland and six miles by water northeast of San Francisco, on the west side of San Francisco Bay and on the Atchison, Topeka and Santa Fé and the Southern Pacific railroads. It has a fine natural deep-water frontage six miles long. It is the terminus of the Standard Oil pipe lines and the home port of the company's fleet of vessels, and there is a large oil refinery. Other industries of the town include porcelain bathroom fittings, brick, pipe and steel works, carbon products, chemicals, furniture and wine. There are also railroad machine shops and yards, and Pullman car shops. The city has grown rapidly. Pop. (1910) 6,802; (1920 Federal census) 16,843.

**RICHMOND,** Canada, the capital of Richmond County, Quebec, 72 miles east of Montreal, on the Saint Francis River, an affluent of the Saint Lawrence, and on the Grand Trunk Railroad. Its chief institution is Saint Francis College, affiliated to McGill University. The town has railway works, machine shops, shoe last factory, sash and door factory and other industrial establishments. There are three banks. The value of all taxable property is estimated at $1,000,000. The educational establishments include a high school, a Brothers' school and convent. The principal buildings are the town-hall, post office, convent, high school, Roman Catholic church, Methodist church, etc. The government is vested in a mayor and councillors. Pop. about 2,300.

**RICHMOND,** England, an ancient town in the county and 50 miles northeast of York (North Riding), on the left bank of the Swale. In and around the town are numerous interesting remains of antiquity, the most remarkable of which is the castle, comprising an area of nearly six acres, and one of the most majestic ruins in England; its great tower, about 100 feet high, is a fine and very perfect specimen of the Norman keep. Pop. about 4,000.

**RICHMOND,** Ind., city, county-seat of Wayne county, on the Whitewater River, and on the Pittsburgh, Cincinnati, Chicago and Saint Louis, the Grand Rapids and Indiana railroads, 68 miles east of Indianapolis and 70 miles northwest of Cincinnati. The Richmond Interurban and the Dayton and Western traction lines connect the city with all nearby places. Richmond was settled and laid out in 1816 by Friends from North Carolina. It was incorporated as a borough in 1834 and chartered as a city in 1840. The city has about 300 manufacturing establishments, employing about 3,500 persons. The chief manufactures are threshers, drills, plows, engines, boilers, carriages, milling machinery, clothing, flour and dairy products. It is the commercial and industrial centre of a large portion of the county. It has a number of fine public buildings, chief of which are the churches and schools. There are 26 churches, 10 public school buildings, two Roman Catholic parish schools and one Lutheran parish school. Other educational institutions are Earlham College (Friends), Saint Mary's Academy (Roman Catholic), one business college and the Morrison-Reeves Free Public Library. The Eastern Indiana Insane Hospital, a State institution, is located here; also other charitable institutions. The government is vested in a mayor and a council of 14 members elected biennially by the people. The metropolitan police board is appointed by the governor. Pop. (1920) 26,728.

**RICHMOND,** Ky., city, county-seat of Madison County, on the Louisville and Nashville Railroad, about 25 miles south-southeast of Lexington and 135 miles east-southeast of Louisville. It is in an agricultural region; in the vicinity is found an excellent building stone. The chief manufactures are tobacco and dairy products, and the trade is chiefly in farm and tobacco products, cattle and horses. Its educational institutions are Madison Institute, under the auspices of the Church of the Disciples, Walter's Collegiate Institute, a Presbyterian institution, and public elementary schools. One of the most desperate battles of the Civil War was fought at Richmond. The Confederate forces under E. Kirby Smith defeated a much larger Federal force under Manson and Nelson. Pop. (1920) 5,622.

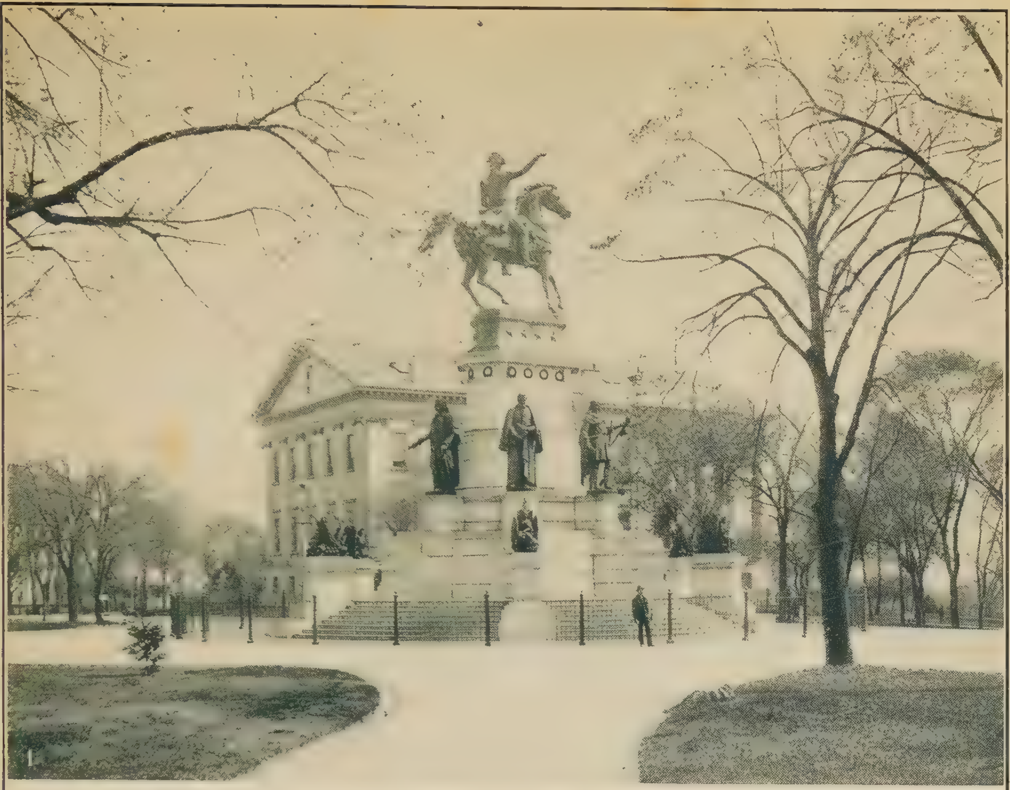
**RICHMOND,** Me., town in Sagadahoc County, on the Kennebec River and on the Maine Central Railroad, 37 miles north-northeast of Portland. It was first settled in 1700; in 1719–20 a fort was erected here for the defense of the settlers against the Indians; this fort twice resisted attack, and was finally dismantled in 1754. The town was incorporated in 1823. The chief industries of the town include a cotton mill and shoe factory, ice cutting and agriculture; there are also saw and planing mills and some trade in lumber. The town has a public high school, with which the Richmond Academy (incorporated 1861) was united, and also a public library. Pop. about 2,000.

**RICHMOND,** Mo., city, county-seat of Ray County, on the Atchison, Topeka and Santa Fé Railroad, 58 miles southeast of Saint Joseph. The county-seat was removed to Richmond from Bluffton in 1827. It is the centre of a fertile agricultural and stock-raising region; and there are coal mines in the vicinity which yield excellent quality of bituminous coal. It also has wagon and plow factories, flour mills and a foundry. It contains the county courthouse and has electric lights and modern waterworks. It is well provided with educational facilities, having two public high schools, of which one, the Lincoln High, is for colored pupils; and is also the seat of Woodson Institute, a coeducational secondary school under the auspices of the Methodist Episcopal Church, South. Pop. (1920) 4,409.

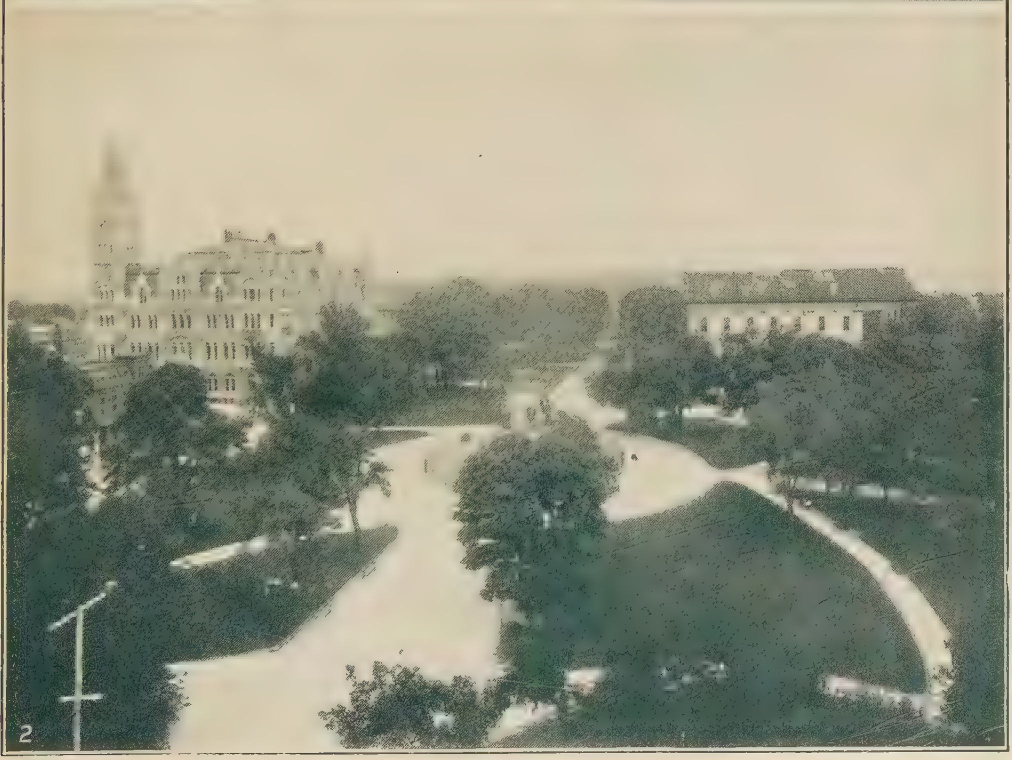
**RICHMOND,** Va., city, port of entry, capital of the State, county-seat of Henrico County, on the James River, the Richmond-Washington Railroad Line, the Atlantic Coast Line, the Chesapeake and Ohio, the Seaboard Air Line and the Southern railroads, about 115 miles almost due south of Washington, D. C., and 90 miles from the mouth of the river at Chesapeake Bay. Area, including the suburbs, 26 square miles. The surface is hilly, rising from the river and the valley of Shockoe Creek in a series of hills, almost terrace-like in formation, until it reaches altitudes of from 170 to 250 feet above sea-level, at which altitudes there are plateaus constituting the principal residential sections. It was originally built on seven hills and was often called the «Modern Rome.» In 1842, when Charles Dickens visited the city, it had extended its limits to another hill, and he wrote of it as «delightfully situated on eight hills overhanging James River.»

Regular lines of steamers, the Virginia Navigation Company and Old Dominion, connect the city with Atlantic and Chesapeake ports and furnish a cheap outlet for shipping products to other parts of the United States

# RICHMOND, VA.

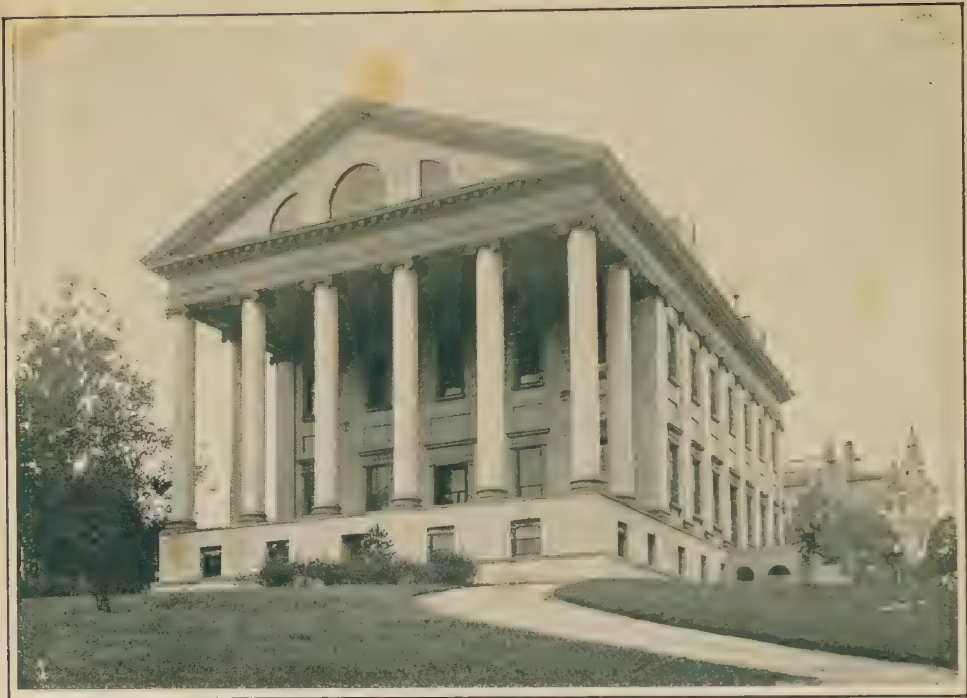


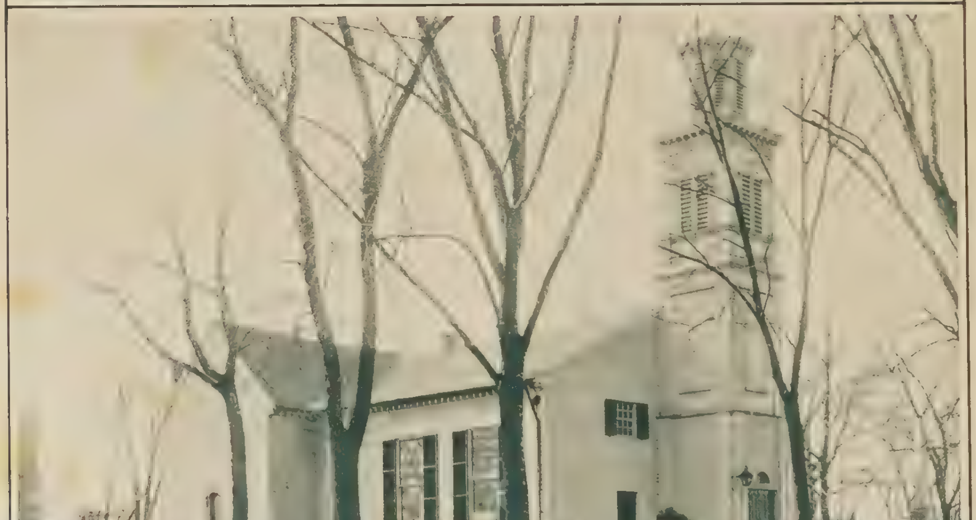
1 Washington Monument, near State Capitol



2 Capitol Square, showing the City Hall Building

# RICHMOND, VA.





1 The Capitol at Richmond, designed by Thomas Jefferson
2 St. John's Church, Richmond, where Patrick Henry made his famous speech

and to foreign ports. James River (q.v.) furnishes water power which is used extensively for manufacturing and for electrical development which propels the entire street-car system and supplies the electric lights of the city. Several bridges (five railroad and two for vehicles, street cars and foot passengers) cross James river and connect the two sections of the city lying on its opposite banks and afford ready access to its suburbs — Forest Hill Park, Bon Air, Granite, Spring Hill and other places on the south side of the river. The streets are all fairly wide, Main, the chief financial thoroughfare, is a broad, well-built street; Broad, the shopping district, is the widest street in the city; Grace and West Franklin, as well as some of the avenues and suburbs, are residential sections. The water supply, which is excellent for domestic and all other purposes, is obtained from the James River at two points above the city. The water is pumped into two reservoirs from which it is piped for distribution throughout the city. The plant comprises an extensive settling basin and system for insuring its clarification at all times. The natural drainage makes the city healthful, and warm winters and temperate summers attract many home seekers who desire a mild climate.

**Industries.**— The chief industries of the city are connected with the preparation of tobacco for local use and for shipment to outside markets. Recent statistics give the annual value of cigars, cigarettes, smoking, chewing and reprising tobacco manufactured at $30,806,680; foundry, machine-shop products and agricultural implements amounted to $18,850,390; fertilizers, chemicals, cement, etc., to $10,987,560; flour milling, cornmeal, etc., to $8,695,750; paper and paper products to $5,958,150; printing, publishing, etc., to $5,985,570; boots and shoes to $5,013,355; other manufacturing establishments produce wagons and carriages, locomotives, ammunition, lumber, saddlery, harness, hides, leather, drugs, medicines, perfumery, etc. The manufacturing concerns number 2,226, employing 32,905 hands. The capital employed is $37,342,940; the total annual sales amount to $135,239,212.

**Commerce.**— The location and the facilities for transportation make Richmond the commercial centre of a large extent of southeastern Virginia, and an important point of distribution for the Carolinas and adjoining Southern States. Richmond has about $17,150,000 invested in the jobbing trade, with annual sales of $120,934,665. Post-office receipts amount to more than $1,000,000 annually (for 1918 they were $1,290,707); internal revenue receipts to $20,000,000, and the Custom House collects duty annually of over $1,000,000 (in 1918, $10,029,948), although the city's imports and exports are principally cleared through the custom-houses of New York and other northern ports. The amount of trade with the United States Atlantic Coast cities and the cities and towns of the interior of the State is very large.

**Banking and Finances.**— The city has over 30 banking institutions, including seven national banks. There are also State banks, savings banks, trust companies, private bankers and brokers and loan and deposit companies. Richmond is a national reserve city and the seat of the Federal Reserve Bank for the Fifth District. The combined resources of the banks exceed $160,000,000; they have a combined capital and surplus of $21,302,599; deposits amount to $102,095,240, and bank clearings for 1918 to $2,404,367,314. The property valuation of Richmond is $230,299,969; public assets amount to $23,613,852. The public debt is $14,252,095. Building operations have averaged nearly $5,000,000 during a recent period of five years, and annual real estate sales amount to $20,712,516. The tax rate is reasonable.

**Government.**— Richmond is governed by a mayor, council and four directors of departments acting under the mayor; has highly efficient police and fire departments, the latter with partially motorized apparatus and equipment. The municipal assets include waterworks, gas plant, city hall, parks, market houses, school buildings, etc.

**Public Buildings, Parks and Monuments.**— Richmond is historic ground and her noted public buildings are valued not only on account of their association but also for the architectural merits which they possess. Capitol square, on Shockoe Hill, has an area of 12 acres. It takes its name from the State capitol, which is on the square. The capitol was built after a model procured by Thomas Jefferson when he was in France, and which was patterned after the Maison Carrée of Nuñes, an ancient Roman temple, the columns being changed, however, from the Corinthian to the Ionic. The cornerstone was laid in 1785, and on 19 Oct. 1789, the eighth anniversary of the surrender of Lord Cornwallis at Yorktown, the Virginia State legislature convened in the new capitol. The model for the capitol is still in the building. In the rotunda is the most valuable piece of marble in America, Houdon's statue of Washington, modeled from life. The general assembly of Virginia (1903–04) appropriated $250,000 for the purpose of adding wings to the east and west sides of this building, for steps to the imposing portico at the southern end and for some interior improvements. These additions are in harmony with the architectural style of the original building and preserve its most characteristic features while they furnish additional room, much needed by the general assembly and the various State departments.

On the same square is the library building, which contains the parole signed by Lord Cornwallis at Yorktown, the original Virginia Bill of Rights, and the Virginia ordinance of secession. The executive mansion is on this square, on land which was once a part of Nathaniel Bacon's plantation. The old building known as the Bell House has many interesting associations. The old bell, purchased in 1790, was for years a «voice to the people.»

Among the famous pieces of statuary on the grounds is the equestrian statue of Washington, by Thomas Crawford (q.v.). Of the statues at the base Crawford completed only Thomas Jefferson and Patrick Henry; the other pieces, George Mason, John Marshall, Thomas Nelson and Andrew Lewis, were made by Randolph Rogers. Nearby stands a fine marble statue of Henry Clay, by Joel T. Hart; also several other marble statues and a bronze statue of «Stonewall» Jackson, by Foley. Three fountains add to the beauty of the square.

The William Byrd Park, the largest of the city, has an area of 300 acres. It has two lakes, a fine boulevard and the chief city reservoir. The Joseph Bryan Park — a gift to the city from the family of the late Joseph Bryan—contains 262 acres. Monroe Park has many fine trees and some good pieces of statuary. Libby Park is on Libby Hill. It is terraced from Main street to the summit, and a monument in honor of the Confederate soldiers and sailors stands on the highest point. Chimborazo Hill Park has an area of 36 acres. A government road leads from the park to the National Cemetery, where are buried 6,547 Federal soldiers who fell in the attempts to capture the city during the Civil War. Jefferson Park is between Pleasant and Marshall streets; Gamble's Hill Park is on a relic of the James River and Kanawha Canal, still used as a race to a number of important water-power plants. It also overlooks the famous Tredegar works, where cannon were made, and the no less famous Belle Isle, the site of the Old Dominion Iron and Nail Works, where a number of Federal prisoners were confined during the war between the States. Lee Circle, in the western part of the city, has a bronze equestrian statue of Robert E. Lee (q.v.), by Mercie, a French sculptor. It represents the general on «Traveller,» his well-known war horse. In Howitzer Park is a monument in memory of the Richmond-Howitzer battalion. A favorite drive is the one to Hollywood, where sleep 12,000 Confederate soldiers. A monument of granite, pyramidal in form, 90 feet high and softened by a covering of Virginia creeper and ivy, has been erected to the memory of the dead Confederate soldiers. Many of Virginia's famous men are buried here. Tyler and Monroe, Presidents of the United States; John R. Thompson, the poet; Matthew F. Maury, «Pathfinder of the Seas»; John Randolph; Jefferson Davis, President of the Confederacy, and a number of Confederate generals. The most noted parks and squares have a combined area of 358 acres; but the little squares and circles, not mentioned as noted, ornament the city and give it an artistic appearance.

Other historic and prominent landmarks are the residence occupied by General Lee and his family, now the home of the Virginia Historical Society; the house occupied by Jefferson Davis while he was President of the Confederate States; and the famous Monumental Church on Broad street, formerly called Academy square. At one time a large wooden building, built for an academy of fine arts, occupied the present site of the church. In 1788 the old building saw a brilliant gathering of «history makers,» who met to discuss the document proposed as the Constitution of the United States of America. Madison, Mason, Marshall, Pendleton, Randolph, Lee, Wythe and others were there, and finally the Constitution as framed at Philadelphia was ratified by Virginia. Only 23 years afterward occurred in the same building at a theatre the terrible disaster which resulted in the death of 72 persons, among whom was the governor of the State. The present church is their monument; the portico extends over their tombs and the charred remains. The house, once the home of Chief Justice Marshall, stands on the street named in his honor. Saint John's Episcopal Church, built in 1740, is in an excellent state of preservation and is still used for religious services. Richard Randolph, who superintended the building of the church, was a descendant of Pocahontas. In the quaint old churchyard surrounding it is the grave of George Wythe, one of the signers of the Declaration of Independence. In this church, on 20 March 1775, was held the famous Virginia Convention which met to hear a report of the first Continental Congress, and to discuss the political situation of the country. The convention feared to hold a session in Williamsburg, the capital, on account of the hostility of Lord Dunmore. The church was the only place in Richmond large enough for the assembly. It was at this convention that Patrick Henry made his famous speech, ending with the words: «Is life so dear, or peace so sweet, as to be purchased at the price of chains and slavery? Forbid it, Almighty God! I know not what course others may take, but as for me, give me liberty or give me death.» The place where the patriotic orator stood is pointed out to strangers. Another interesting event occurred on 6 Jan. 1781, when Benedict Arnold, at the head of a British force of 900, entered the city, and a number of the soldiers were quartered in this old church. The oldest house in Richmond, a stone building on Main street, was built in 1737 by Jacob Ege. It is now used as a historical museum. The Valentine Museum contains over 100,000 archæological specimens, also many fine pictures and statues. This valuable museum was given to the city by Mann S. Valentine. His brother, Edward V. Valentine, the sculptor, has given to the museum several valuable pieces of statuary. The most costly and the most ornate building in the city of Richmond is the city hall, completed in 1893 at an outlay of over $1,400,000. It is built of Richmond granite, dressed and quarry-faced, is completely fireproof, and commodious in all its appointments.

**Education.**—The city has an excellent school system; there are public and parish elementary schools for white and similar ones for colored pupils, a high school, normal school for whites and one for colored, Virginia Mechanics' Institute which has evening classes, kindergartens and a number of private schools. The secondary schools and colleges are the Richmond Female Institute (Baptist), founded in 1854; Richmond Female Seminary (Protestant Episcopal); Hartshorn Memorial College for Colored Girls (Baptist), opened in 1883; Visitation Academy (Roman Catholic), founded in 1860; Saint Peter's Academy (Roman Catholic); Saint Joseph's Academy (Roman Catholic); Saint Patrick's Academy (Roman Catholic); Sacred Heart Academy (Roman Catholic); Saint Mary's Benedictine Institute (Roman Catholic); Training School for Kindergarteners; Art School of Art Club, and Saint Andrew's School, the Medical College of Virginia (1837); Richmond Theological Seminary (Baptist), opened in 1807; Richmond College, opened in 1832; and beyond the city limits, Hartshorn and two others. There are five public libraries with an aggregate of over 60,000 volumes.

**Churches.**— The city has 130 religious organizations and 90 church edifices; 65 for white people and the others for colored. The different denominations rank according to church edifices and organizations as follows: Baptists, Protestant Episcopalians, Methodists, Presbyterians, Roman Catholics, Lutherans, Jews, Christians, Friends. The Roman Catholic Cathedral, built with means supplied through the munificence of Mr. and Mrs. Thomas F. Ryan of New York, is the finest church edifice in the city.

**Charitable Institutions and Hospitals.**— There are here Saint Sophia's Home for the Aged, the Sheltering Arms, the Home for Incurables, Foundling Asylum, Retreat for the sick, city orphan asylum, Lee Camp Soldiers' Home and Saint Joseph's Orphan Asylum. There are a number of public and church aid societies and various charitable organizations. Saint Luke's Hospital is one of the best equipped institutions in the city.

**History.**— In May 1607, John Smith, Captain Newport and others ascended the James River as far as the place where Richmond now stands. In September 1609, Smith, who was the president at Jamestown, again ascended the river to find a better location for the colony than Jamestown. He purchased from the Indians some land near the present site of Richmond, and so pleased was he with the place that he called it «None Such.» «Forte Charles» was built below the falls, in 1645. In 1675 and in 1687 a further grant of 950 acres was made, which tracts included the land upon which Richmond now stands, but the city was not founded until some years later by Col. William Evelyn Byrd. He seems to have been versed in methods of founding cities which are now called modern. He established two cities «on paper,» one at Sohocco's to be called Richmond, and at the «Point of Appamattuck River,» to be called Petersburgh. He engaged Major Mayo to lay out the squares, streets, etc. Then he proceeded to advertise his cities, inserting a notice in the Virginia *Gazette,* April 1737, «that on the north side of James River, near the uppermost landing and a little below the falls, is lately built by Major Mayo a town called Richmond, with streets 60 feet wide, in a pleasant and healthy situation, and well supplied with springs of good water.» Byrd was a learned man as well as a good advertiser. He brought to the New World a large and well selected library, a catalogue of which is in the Franklin Library in Philadelphia. He proceeded to build a mill, a warehouse, and such other buildings as were necessary. In its early days the place was called Byrd's Warehouse. In 1742 the assembly of Virginia established the town, and the wide streets and squares were at last laid out. In 1779 the capital of the commonwealth was changed from Williamsburg to Richmond. Then the place was only a number of disconnected houses in small groups, with rough ground and rocks intervening. Benedict Arnold entered the city in 1781 and burned a portion of it, as already mentioned. In 1782 Richmond was incorporated as a city, and in 1785 the foundation of the capitol was begun. This capitol, from its opening in 1789 down to the present, has been the scene of many stirring historical events. In 1798–99 took place the famous debates which ended in the adoption of the resolutions, drafted by James Madison, regarding the interpretation of the Federal compact. What powerful conventions were held here when such men as Monroe, Madison, John Randolph and Marshall were members. The convention of 1851 extended the privilege of suffrage, and here in 1861 the Act of Secession was adopted; and in June of the same year, Richmond was made the capital of the Confederate States. In July 1862, the Congress of the Confederacy convened here and remained in session until April 1865. During the Civil War the city was the great objective point of the chief operations of the Union army in the East. Again and again the Union forces marched to the battle cry «On to Richmond,» and again and again were they repulsed. For three years, from May 1862 to April 1865, the city was almost in a constant state of siege; the records tell of 15 pitched battles and 25 skirmishes and sharp engagements which were fought in efforts to capture the city. When its defenders yielded and left the city they set fire to the arsenals and large tobacco warehouses, and burned the bridges directly after crossing them, which caused a most extensive conflagration in the principal business sections. On 27 April 1870, at a contest over the mayoralty before the Supreme Court of Appeals, over 60 persons were killed by the giving away of the floor of the court room. A large number of people were in the building.

The suburbs of Richmond contribute to the charms of the city and to its history pages. The broad, shady avenues of stately, beautiful trees lead out to battle grounds now covered with the houses and business establishments of busy, peaceful people.

The population in 1890 was 81,388 and in 1900, 85,050 but these figures by no means indicated the growth and prosperity of the city. With the exception of the annexation of Lee District, which was just beginning to be built up, the corporate limits had not been extended since 1867, and in many quarters the suburbs were thickly settled and were indistinguishable from the adjacent districts of the city. The population was increased by some 30,000, when the much-needed expansion of the city limits went into effect. This placed it where it properly belonged, in the ranks of cities of over 100,000 inhabitants. Pop. (1910) 127,628; (1920) 171,667.

Consult Henry, W. W., «Richmond on the James» in ‹Historic Towns of the Southern States› (New York 1900); Mordecai, S., ‹Richmond in By-Gone Days› (Richmond 1856; 2d ed., 1860); «Richmond since the War» in *Scribner's Monthly* (New York 1877); Wood, ‹The Industries of Richmond› (Richmond 1886).

F. D. Dunlop,
*Secretary and Treasurer Richmond Chamber of Commerce.*

**RICHMOND** (Ky.), **Battle of,** the most decisive Confederate victory of the Civil War. On 14 Aug. 1862, Gen. E. Kirby Smith left Knoxville, Tenn., to unite with General Bragg in northern Kentucky, He passed through Big Creek Gap of the Cumberland Mountains and, leaving General Stevenson's division to observe the Union forces at Cumberland Gap, penetrated Kentucky with about 6,000 men. Preceded by Col. J. S. Scott's cavalry force of 900 men, he moved in the direction of Frankfort, threatening both Louisville and Cincinnati. Gen. Lew

Wallace, with a regiment, hastened from Louisville to Lexington, and there found other forces, over which he was placed in command; new regiments came from north of the Ohio; but as Wallace was about to move forward and oppose Smith he was superseded by General Nelson, who had been ordered by General Buell to take charge of affairs in Kentucky. Upon his arrival Nelson organized the troops at Lexington into a division of three brigades, under Gens. M. D. Manson, Charles Cruft and J. S. Jackson; and hearing that the Confederates were approaching, he sent forward some Kentucky cavalry to oppose them. There were several sharp cavalry affairs, in which the Union cavalry showed such aggression that Kirby Smith determined to make an immediate attack upon the Union forces at Richmond, although his troops were jaded by long and laborious marches, and General Heth's division of 4,000 men was still far to the rear. He had for the attack Cleburne's and Churchill's divisions of 6,000 men and Scott's cavalry brigade of about 850, and the advance was ordered for the morning of 30 August. Scott's cavalry encountered Manson's brigade about half a mile south of Rogersville, and Cleburne, coming up with two brigades, attacked Manson, who, reinforced by a regiment of Cruft's brigade and a battery, endeavored to turn Cleburne's right, but was repulsed. Meanwhile Churchill's division had come to Cleburne's support; a brigade flanked Manson's right and drove it back in disorder; and as the rout became general, another of Cruft's regiments came up, but was quickly repulsed with heavy loss. Another position was taken farther to the rear, where the troops were under partial cover, with artillery on the flanks. This the Confederates soon attacked; Churchill's division struck Cruft's brigade, which was on the right, and drove it back in disorder; and Cleburne advancing in front, Manson's entire line went back, the Confederates in close pursuit. Manson had but partially formed another line in front of Richmond, when General Nelson came on the field and selected a new line near the town and cemetery; and the troops, barely 2,200 in number, had scarcely taken position when the Confederates were upon them in flank and front, fired about three volleys, and the Union troops gave way in utter rout. Early in the day Scott's cavalry had gained the road in rear of Richmond, and the knowledge of the fact increased the demoralization. Nelson, wounded, narrowly escaped to Lexington and thence to Louisville. Manson was wounded and taken prisoner, with over 4,000 of his men, while nine guns, over 6,000 muskets and the entire wagon-train were lost. The fragments of the army made their way to Louisville. The Union troops engaged numbered 6,500 raw men; the Confederates about 6,800 veteran troops. The Union loss was 206 killed, 844 wounded and 4,303 captured or missing, an aggregate of 5,353. The Confederate loss was 78 killed, 372 wounded, and one missing, an aggregate of 461. General Heth, with his division of 4,000 men, joined Smith after the battle, and marched to Lexington, where he arrived 2 September, and the legislature, then in session at Frankfort, fled to Louisville. Heth marched northward to Cynthiana, and to within a few miles of Covington, to threaten Cincinnati, which he found too well defended to attack, and being in turn threatened, he withdrew to join Smith, who waited at Lexington to join forces with General Bragg, then operating against General Buell. (See PERRYVILLE, BATTLE OF). Consult 'Official Records' (Vol. XVI); Van Horne, 'History of the Army of the Cumberland' (Vol. I); The Century Company's 'Battles and Leaders of the Civil War' (Vol. III).

E. A. CARMAN.

**RICHMOND, Borough of.** See NEW YORK CITY.

**RICHMOND (Va.), Kilpatrick's Expedition to.** In February 1864 a cavalry expedition organized to make a dash on Richmond, distribute President Lincoln's amnesty proclamation, and liberate the Union prisoners in the city and on Belle Isle. The expedition was put under command of General Kilpatrick, who, with 4,000 men and a battery of artillery, marched from Stevensburg, crossed the Rapidan at Ely's Ford, early on the night of 28 February, and moved swiftly to Spottsylvania Court House. Here Col. Ulric Dahlgren, with 500 men, was detached from the column, on the morning of the 29th, to cross James River and enter Richmond from the south. Kilpatrick continued his course to the Virginia Central Railroad at Beaver Dam Station, thence to Ground Squirrel Bridge over the South Anna, and to a point five miles from Richmond, which was reached on the morning of 1 March. Believing that his approach was unknown, and that a small force of infantry only occupied the intrenchments, he moved on the Brook road toward the interior line of defensive works, driving in a few pickets, and found infantry and artillery in the works — 500 men and six guns. He opened with artillery, and was about to attack, when he thought he saw reinforcements of infantry filing into the Confederate works, and, feeling certain that Dahlgren had failed, and that his own attack would be a bloody failure, he withdrew to Atlee Station, north of the Chickahominy, and went into camp. Here he was attacked during the night by Wade Hampton's and Bradley T. Johnson's cavalry, the latter having followed him from Beaver Dam Station. The camp of one of his brigades was captured, and Kilpatrick, retreating, was followed down the Peninsula, being joined near Tunstall's Station next day by nearly 300 of Dahlgren's men. He reached Williamsburg on the night of the 2d.

Colonel Dahlgren moved from Spottsylvania Court House across the Virginia Central Railroad, near Frederickshall, to James River, near Goochland Court House, where he expected to cross the river, release the prisoners on Belle Isle, and enter Richmond from the south, to unite with Kilpatrick at 10 A.M. of 1 March But he could find no ford, so marched by the north bank of the river, approaching Richmond late in the afternoon, and coming upon cavalry and infantry, with which he skirmished sharply until night. Hearing nothing from Kilpatrick, except his guns, heard early in the afternoon, and rightly believing that he had failed, Dahlgren withdrew, designating Captain Mitchell, 2d New York cavalry, to command the rear guard. In the darkness the column became broken, Dahlgren, with less than 100 men going in one direction, and Mitchell in another. Mitchell succeeded in joining Kilpatrick at Tunstall's with about 260 men. Dahlgren crossed the Pamunkey at Hanover Town, and the Mattapony at Aylett's Ford, and about midnight 2 March fell into an ambuscade and was killed. Others were killed and wounded, nearly all were captured. Captain Mitchell reports that of the 500 men of Dahlgren's command 61 were killed and wounded, and 138 captured. The total loss of Kilpatrick's command, including Dahlgren's, was about 350. Consult 'Official Records' (Vol. XXXIII); Humphreys, 'From Gettysburg to the Rapidan'; The Century Company's 'Battles and Leaders of the Civil War' (Vol. IV).

E. A. Carman.

**RICHMOND** (Va.), **Sheridan's Raid on the Communications with,** a movement which included the battle of Yellow Tavern. At daybreak 9 May 1864, General Sheridan, with 10,000 cavalry and six batteries, started from near Todd's Tavern to cut the railroads entering Richmond from the north and northwest. He moved on the Telegraph road; Merritt's division crossed the North Anna at Anderson's Ford at dark and encamped; the rest of the column, harassed by a brigade of Stuart's cavalry, halted for the night on the north side of the river. The march was resumed early on the 10th, several miles of the Virginia Central Railroad destroyed, with rolling-stock and supplies, and at night Sheridan crossed the South Anna, halting at daylight of the 11th on the south bank. Early in the day Davies' brigade encountered Munford's cavalry at Ashland, on the Fredericksburg Railroad, drove it from the place, destroyed the depot and several miles of railroad, and joined Sheridan's main body at Allen's Station. Meanwhile General Fitzhugh Lee's cavalry division had been rapidly marching by a circuitous route to interpose between Sheridan and Richmond, and had reached Yellow Tavern, on the Brook road, six miles from Richmond. Lee had barely 4,500 men. Sheridan's whole force advanced, Merritt's division leading, followed by Wilson's and Gregg's. Merritt attacked and gained the Brook road at Yellow Tavern, but General Stuart, in command of the Confederates, seized a position on his flank and enfiladed his line with artillery. Then Custer's brigade, supported by Wilson's division, charged the flanking force, breaking it and capturing two guns. In this encounter Stuart was mortally wounded. Stuart's detached brigade, under Gen. James B. Gordon, fell upon Sheridan's rear, but Gregg drove it back toward Ashland. Fitzhugh Lee's division retreated toward Richmond. The losses on both sides were severe. Sheridan followed Lee's division and entered the most advanced line of works covering Richmond. Sheridan had intended to keep south of the Chickahominy and march by way of Fair Oaks, to make a demonstration on Richmond. Marching during the night, at daylight of the 12th he massed his force at Meadow Bridge, overlooking the line of the Virginia Central Railroad and the Mechanicsville pike. After demonstrating on the Confederate works, which were found too strong to be attacked, he determined to recross the Chickahominy at Meadow Bridge. The bridge, which had been partially destroyed, was held by some of Gordon's cavalry and a battery on the north side. Merritt's division crossed after a severe engagement, in which Gen. James B. Gordon, commanding the Confederate cavalry, was killed. Meanwhile, Wilson's division could not pass the second line of the Richmond defenses, on the Mechanicsville road, and was attacked by Barton's and Gracie's infantry brigades and some dismounted cavalry, who, advancing from the works, attacked both Wilson and Gregg, at first with success, driving Wilson in some disorder. After a severe contest the Confederates were driven back to their works, and between 3 and 4 P.M. Wilson and Gregg crossed the Chickahominy above Mechanicsville bridge, and Sheridan encamped his corps near Gaines' Mill. Next day he crossed to the south side of the Chickahominy by Bottom's bridge, marched through White Oak Swamp and, on the 14th, encamped in the vicinity of Haxall's Landing, on James River. He made several demonstrations on the New Market road, in the direction of Richmond, and having drawn supplies from General Butler's army, started on the 17th to rejoin the Army of the Potomac, marching by way of White House, on the Pamunkey. Detachments were sent to destroy the railroad bridges over the South Anna and to demonstrate on Richmond, and 24 May Sheridan rejoined Grant's army near Chesterfield bridge on the North Anna. The Union loss in the movement from 9 May was 64 killed, 337 wounded, and 224 missing. There are no reports of Confederate losses. Consult 'Official Records' (Vol. XXXVI); Humphreys, 'The Virginia Campaign of 1864–65'; Sheridan, 'Personal Memoirs' (Vol. II); McClellan, 'Life and Campaigns of General Stuart'; The Century Company's 'Battles and Leaders of the Civil War' (Vol. IV).

E. A. Carman.

**RICHMOND** (Va.), **Union Campaigns Against.** As the capital and political centre of the Southern Confederacy, defended by its best army, Richmond became and continued to be the objective point of the Union armies. The first campaign against it was that of General McDowell, which ended in Union defeat at Bull Run, 21 July 1861. (See Bull Run, First Battle of). The next campaign had its base at Fort Monroe, from which, 4 April 1862, General McClellan advanced with the Army of the Potomac up the York Peninsula. After the siege and capture of Yorktown and the battle of Williamsburg (qq.v.), McClellan crossed the Chickahominy, and 30 May his outposts were within five miles of Richmond. Meanwhile, after the destruction, by her commander, of the Confederate ram *Merrimac,* Capt. John Rodgers, with three Union gunboats, ascended James River until he reached Fort Darling (q.v.), on Drewry's Bluff, eight miles below Richmond, where, 15 May, he was stopped by the fire of heavy guns. Commodore Goldsborough, commanding the navy in those waters, now proposed to McClellan to co-operate with him in a joint naval and land attack on Fort Darling, but McClellan declined, preferring to wait until after he should have crossed the Chickahominy. The Confederate authorities were so much impressed with the gravity of the situation, when they heard that the fleet was ascending the river, that the government archives were shipped to Columbia, S. C., and the public funds were kept on cars ready for transportation.

The Confederate defense at Fort Darling was looked upon as the salvation of the Confederate capital. Strong works were now constructed by the Confederates on Drewry's Bluff and on the opposite side of the river, and to the end of the war they barred advance on Richmond by water. Elaborate works were constructed to defend the city from the land side. On 31 May Gen. J. E. Johnston, commanding the Confederate army, advanced from his works around Richmond and attacked McClellan. The battle continued two days, at the end of which the relative positions of the two armies were unchanged. (See FAIR OAKS, BATTLE OF). On 25 June McClellan, in view of a general advance, threw forward a part of his force toward Richmond, gaining some ground, but Gen. R. E. Lee, commanding the Army of Northern Virginia, assumed the offensive on the 26th by crossing the Chickahominy and attacking McClellan's right, forcing McClellan to retreat to Harrison's Landing, on James River, after a series of hard-fought, bloody battles. (See PENINSULA CAMPAIGN OF 1862; SEVEN DAYS' BATTLES). Richmond now had some respite. Lee invaded Maryland, and upon his return defended Richmond on the line of the Rappahannock, from which Burnside in December 1862 and Hooker in April 1863 unsuccessfully endeavored to force him. Lee again assumed the offensive and marched northward for an invasion of Maryland and Pennsylvania, leaving but a small force at Richmond, and Hooker, 10 June, proposed to march immediately upon the city, capture it and then send the disposable part of his force to any threatened point north of the Potomac, but the proposition was negatived by General Halleck, and Hooker was informed by President Lincoln that Lee's army and not Richmond was his true objective. On 14 June Halleck ordered General Dix, commanding at Fort Monroe, to send an expedition to threaten Richmond and destroy the railroad bridges over the South and North Anna rivers. Dix drew troops from Suffolk and Norfolk, and on the 24th Colonel Spear, with about 1,200 men of the 11th Pennsylvania, 2d Massachusetts and 12th Illinois cavalry, was sent by water up York River, landed at White House on the 25th, marched through Hanover Court House and on the 26th attacked and captured about 100 men of the 44th North Carolina at the bridge of the Virginia Central Railroad over the South Anna, burned the bridge and returned to White House on the morning of the 27th. Upon Spear's return Dix organized an expedition of 10,000 men, under General Getty, to destroy the bridge of the Fredericksburg and Richmond Railroad over the South Anna, and an expedition of 6,000 men and 14 guns, under General Keyes, to threaten Richmond by seizing Bottom's Bridge over the Chickahominy. Both expeditions moved from White House on 1 July. Keyes failed to accomplish anything, being held in check by a small force under Gen. D. H. Hill. Getty, preceded by Spear's cavalry, marched from White House to Hanover Court House, which he occupied on the 4th, his advance reaching the bridge over the South Anna late in the day and making an attack, which was repulsed by Gen. John R. Cooke, who had about 4,000 men. General Foster, who was in command of Getty's advance, destroyed some of the railroad track, and during the night was recalled to Hanover Court House. The depot and track at Ashland Station was destroyed, and on the 5th Getty took up the return march to White House, which was reached on the 7th, his loss being 16 killed, wounded and missing. Dix returned to Fort Monroe and sent part of his command to the Army of the Potomac.

After the Gettysburg campaign (see GETTYSBURG, CAMPAIGN AND BATTLE OF), General Lee fell back beyond the upper Rappahannock and General Meade followed. Meade was forced back to Centreville, and, renewing the offensive, pushed Lee beyond the Rappahannock and then beyond the Rapidan. Meade now essayed an advance on Richmond by passing Lee's right, but was checked at Mine Run (q.v.), 28–29 Nov. 1863.

On the morning of 6 Feb. 1864 Gen. I. I. Wistar, with 2,200 cavalry and 4,000 infantry, left Williamsburg to make a dash on Richmond and release the Union prisoners there. The cavalry advance arrived at Bottom's Bridge, on the Chickahominy, about 13 miles from Richmond, before daylight of the 7th, and found the Confederates in force under Gen. Eppa Hunton, and reinforcements coming up by railroad from Richmond. A deserter from the Union army had given information of the proposed movement, troops had been sent from Richmond, Bottom's Bridge taken up and the fords obstructed. The cavalry charged one of the fords and was repulsed by canister fire with some loss, and Wistar desisted from further effort and returned to Williamsburg. To cover this movement and divert Lee's attention from it, the cavalry and two corps of the Army of the Potomac made a demonstration on the 6th upon Lee's army at Morton's Ford, the demonstration continuing on the 7th with considerable loss. Later in the month General Kilpatrick made a movement on Richmond which resulted in a lamentable failure. See RICHMOND, KILPATRICK'S EXPEDITION TO.

The next and final campaign against Richmond was conducted by General Grant, beginning in May 1864. With the Army of the Potomac he advanced from the north, while General Butler, with the Army of the James, crossed to the south side of James River and marched up its right bank. Butler was defeated at Drewry's Bluff (q.v.), 16 May and confined to his intrenchments at Bermuda Hundred (q.v.). The Army of the Potomac began the campaign by the battle of the Wilderness (q.v.), 5–7 May, and on the 9th General Sheridan set out on his raid, elsewhere described. (See RICHMOND, SHERIDAN'S RAID ON, and the BATTLE OF YELLOW TAVERN). Grant continued his campaign in a series of sanguinary battles, and after the bloody repulse of Cold Harbor (q.v.) he abandoned the campaign north of the James, crossed to the south side of the river 14–16 June and invested Petersburg and Richmond from that side. (See PETERSBURG, MILITARY OPERATIONS AGAINST). The siege began on 19 June 1864 and continued until 2 April 1865, when Petersburg was assaulted and taken, and that night Richmond was evacuated, the Union troops under General Weitzel occupying it 3 April.

E. A. CARMAN.

**RICHMOND, University of,** located at Richmond, Va. It was founded in 1832 by the Baptists under the name of the Virginia Baptist Seminary; the name was changed to Richmond College in 1840. The college was closed during the Civil War; the buildings were used as a hospital by the Confederates and as barracks by the Federals after their occupation of Richmond. The equipment was largely destroyed and much of the endowment rendered worthless, but the college was reopened in 1866, a new endowment was obtained, and it has since then been prosperous and has taken a leading part in Southern educational life. Courses are elected in accordance with the group system, there being three groups. The degrees of A.B. and B.S. are conferred; and A.M. for graduate work. There is also a School of Law, which confers the degree of B.L. Women were admitted to the college in 1898. In 1914 Westhampton College, an institution for women, was opened. The two colleges have the same president, the same board of trustees and the same male faculty. They are, however, simply co-ordinate institutions and cannot be called coeducational. The total annual attendance of students of both colleges is over 800; the faculty numbers 46. The value of the buildings and grounds is about $3,450,000 and the income about $230,000.

**RICHTER,** rĭh'tėr, **Adrian Ludwig,** German painter and designer: b. Dresden, 28 Sept. 1803; d. near there, 19 June 1884. His father, Karl August Richter, the well-known copperplate engraver, was his first teacher, as he was his father's collaborateur in the production of landscapes in black and white. In 1820 he accompanied Prince Narischkin in a journey through France as draughtsman to illustrate that nobleman's travels; subsequently he spent three years, ending 1826, in Italy. He next applied himself to study the masters of the North Holland School, and chose J. Schnorr as his especial model and standard of excellence. Returning to Germany he was appointed in 1828 to a position in the School of Design at Meissen, which he held for 10 years, meanwhile acquiring a popular reputation as illustrator of ‹The Vicar of Wakefield› and ‹Popular Books of Germany.› He inaugurated an epoch in German illustrative art by his sympathetic interpretation of common life in Germany, his tender humor and refined fancy. While he drew on wood for book illustration, he also executed numerous etchings, mostly of Italian landscapes. The most important of his landscapes in oil, which, however, are marred by a certain coldness of treatment, are ‹Storm on Mount Gerone› (1830, in the Museum, Frankfort-on-Main); ‹Harvest Time on the Roman Campagna› (1833, Leipzig Museum); ‹Schreckenstein near Aussig›; ‹Landscape in the Riesen Mountains,› etc. After working for some years as professor of landscape painting in the Dresden Academy, he retired in 1876 on a pension provided by the German emperor. Consult his autobiography, ‹Lebenserinnerung eines deutschen Malers› (1855); Hoff, ‹Adrian Ludwig Richter, Maler und Radierer› (1877).

**RICHTER, Gustav,** German painter: b. Berlin, 31 Aug. 1823; d. there, 3 April 1884. He studied under Eduard Holbein in Berlin and Cogniet at Paris, and also at Rome. He was professor of the Berlin Academy and honorary member of the academies of Munich and Vienna. His first work to attract attention was the ‹Raising of Jairus' Daughter› (1856). In 1864 he received the Grand Medal at Berlin; other medals have been conferred on him at Paris, Brussels, Vienna and Philadelphia. His works are reproduced in vivid colored chromos. He painted many European celebrities, and of Americans a notable portrait of George Bancroft, the historian.

**RICHTER, Hans,** Austrian musical conductor: b. Raab, Hungary, 7 Aug. 1843. He was the son of the capellmeister of the cathedral and entered the conservatorium at Vienna in 1860. He studied the horn under Kleinecke, the violin under Heissler and theory under Sechter. He was conductor of the Hofund National Theatre, Munich, in 1868–69, after which he visited Paris and Brussels. He became chief conductor of the National Theatre, Pesth, in 1871; and in 1875 succeeded Dessoff as conductor of the Court opera at Vienna, holding at the same time the conductorship of the Philharmonic Concerts. He became Court capellmeister in 1878; and in 1879 he inaugurated in London the Orchestral Festival Concerts, later known as the Richter Concerts and continued successfully for many years. He became conductor of the Manchester orchestra in 1897; and from 1885 until his return to Vienna in 1911 he conducted the Birmingham Festival. He is regarded as one of the greatest living conductors.

**RICHTER, Henry Joseph,** American Roman Catholic bishop: b. Neunkirchen, Oldenburg, Germany, 9 April 1838; d. 26 Dec. 1916. He came to the United States in 1854, studied at Saint Xavier's College, New York, at Mount Saint Mary's Seminary, Cincinnati and in 1860 entered the American College at Rome, where he was graduated in 1865. He was ordained in that year, was vice-president and professor of dogma, philosophy and literature at Mount Saint Mary's Seminary, Cincinnati, in 1865–70 and in 1870–83 was rector at Saint Lawrence and chaplain of Mount Saint Vincent Academy. In 1883 he was consecrated first bishop of Grand Rapids.

**RICHTER, Johann Paul Friedrich,** generally known as JEAN PAUL, German author: b. Wunsiedel, near Baireuth, Bavaria, 21 March 1763; d. Baireuth, 14 Nov. 1825. He was educated at Leipzig and became a tutor and schoolmaster. In 1794 he turned from teaching to a general literary activity. The prince-primate Dalberg gave him in 1809 an annual pension of 1,000 florins, continued by the king of Bavaria. The fantastic quality of his genius was at first disconcerting but gradually, says Carlyle, he became considered «not a strange crackbrained mixture of enthusiast and buffoon, but a man of infinite humor, sensibility, force and penetration.» His style is perhaps one of the most barbarous and his books are quite without structure. His humor, however, is genuine, though frequently clumsy. He affected boldly to despise all literary proportion and technique and is recompensed by having the bulk of his work pronounced difficult or unreadable. Yet scattered through his writings are the best of aphorisms and some of the most finely imagined passages in German literature. These may serve to account for the interest Carlyle and De Quincy took in him. Outside of Germany he has not been greatly read, though there are various English renderings of his volumes, such as ‘Walt and Vult’ by Lee (1846); ‘Titan’ by Brooks (1863); ‘Flower, Fruit and Thorn Pieces’ by Ewing (1877); and ‘Levana’ by Wood (1887). His first novel, ‘Die unsichtbare Loge’ (‘The Invisible Lodge’) appeared in 1793. It was followed by ‘Hesperus’ (1794); ‘Biographische Belustigungen unter der Gehirnschale einer Riesin’ (‘Biographical Recreations under the Skull of a Giantess,’ 1796); ‘Leben des Quintus Fixlein’ (1796); ‘Blumen, Frucht und Dornenstücke’ (‘Flower, Fruit and Thorn Pieces,’ 1796); ‘Der Jubelsenior’ (‘Parson in Jubilee,’ 1797); ‘Das Kampaner Thal’ (1797); ‘Titan’ (1800); ‘Flegeljahre’ (translated by Carlyle, ‘Wild Oats,’ 1804). The two last are regarded as among his best productions. ‘Das heimliche Klaglied der jetzigen Männer’ appeared in 1801; ‘Dr. Katzenberger's Badereise’ (1809); ‘Des Feldpredigers Schmelzle Reise nach Flätz’ (1809); ‘Leben Fibels’ (1812); ‘Der Komet, oder Nicolaus Markgraf’ (1820–22); ‘Die Vorschule der Aesthetik,’ his first important philosophical work, appeared in 1804, followed by ‘Levana, oder Erziehungslehre’ (1807), a work on education. Further titles are ‘Friedenspredigt’ (1808); ‘Dämmerungen für Deutschland’ (1809); ‘Mars und Phöbus’ Thronwechsel im Jahr 1814’ (1814); ‘Politische Fastenpredigten’ (1817. A collection of his works, ‘Sämmtliche Werke,’ edited by him before his death, was published in 65 volumes (1826–38). ‘Der Papierdrache,’ his last work, was published in 1845. Consult Spazier, R. O., ‘Jean Paul Friedrich Richter, ein biographisches Commentar zu dessen Werken’ (1833); Carlyle's two essays on Richter; Förster, ‘Denkwürdigkeiten aus dem Leben Richters’ (1863); and Nerrlich, P., ‘Jean Paul und seine Zeitgenossen’ (1889).

**RICHTHOFEN,** rĭH'hōf-ĕn, **Ferdinand,** Baron von, German geologist: b. Karlsruhe, 5 May 1833; d. Berlin, 7 Oct. 1905. He was educated at the universities of Breslau and Berlin; and went to Austria in 1856 to study the geology of Tyrol, Siebenbürgen and northern Hungary. In 1860 he joined a Prussian expedition to the East and spent 12 years in China, Japan, Siam, Java, the Philippine Islands, Formosa, California and Nevada. Returning to Europe in 1872, he accepted professorships at Bonn, Leipzig and Berlin, successively. He published ‘China, Ergebnisse eigner Reisen und darauf gegründeter Studien’ (1877–83), and the following have appeared in English: ‘The Comstock Lode’ (1865); ‘Principles of the Natural System of Volcanic Rocks’ (1867); ‘Letters to the Shanghai Chamber of Commerce’ (1869–72).

**RICHWOOD,** Ohio, village in Union County, on the Erie Railroad, 34 miles northwest of Columbus. It was settled in 1832 and its growth during the first 30 years was slow; since 1870 it has become the second town of the county in size and importance. It is the centre of an agricultural region; contains flour and planing mills, tile mills, poultry packing houses and several large grain elevators and has a considerable trade. It has a public high-school with a school library and grade schools, a normal school, city building, etc. The three banks have combined resources of $1,300,000. The value of taxable property is estimated at $2,000,000. The yearly receipts average $23,500. There are four miles of paved streets. Pop. 1,850.

**RICHWOOD,** W. Va., town in Nicholas County, on the Cherry River, 60 miles southeast of Charleston, on the Baltimore and Ohio Railroad. It is situated in a coal and timber region and has paper mills and a tannery. Pop. (1920) 4,331.

**RICIMER,** rĭs'ĭ-mėr, Roman general of the 5th century A.D.; d. 472. He was a barbarian, but his youth was passed at the Court of Valentinian III, and he received his training under Aëtius. For a long time he was «kingmaker» in the West. He deposed Avitus, and elevated successively Flavius Anitus (454–56), Majorianus (457–61), Libius Severus (461). After Libius' death, he himself ruled for a time as Patricius, until in 467 the danger of a Vandal invasion compelled an alliance of East and West, and the elevation of Procopius Anthemius. Ricimer later grew openly hostile to the monarch, whom he murdered 11 July 472 during a sack of Rome. He then made Olybrius emperor, and died soon afterward.

**RICKARDITE.** A purple copper telluride $Cu_4Te_3$ found in Good Hope mine, Gunnison County, Colo.

**RICKARDS,** rĭk'ạrdz, **Marcus Samuel Cam,** English poet and naturalist: b. Exeter, 28 April 1840. He was educated at Oxford, admitted a solicitor in 1862, and practised for many years in Bristol. In 1876 he took priest's orders in the English Church, was curate of Holy Trinity at Clifton, near Bristol, till 1889, and was then vicar of Twigworth, Gloucestershire, till 1913. Among his many published works, mainly in verse, are ‘Creation's Hope’ (1890); ‘Poems of Life and Death’ (1895); ‘Poems of a Naturalist’ (1896); ‘Musings and Melodies’ (1902); ‘Poems, Old and New’ (1905); ‘Echoes of the Infinite’ (1909); ‘A Soul's Symphony’ (1913); ‘Echoes from the Epistles’ (1915), etc.

**RICKETS,** a disease of children in which there is an affection of the general nutrition of the whole body, dependent chiefly upon improper feeding and want of fresh air and exercise. The disease commonly appears after the age of nine months and before that of two years, producing its most obvious effects on the growth of the bones. It is characterized by enlargement of the head, prominent forehead, projecting breast-bone, flattened ribs, big belly and emaciated limbs, with great debility. The bones and spine of the back are variously distorted. Nature frequently restores the general health, and leaves the limbs in a state of distortion. In the treatment of rickets tonic medicines, the cold bath, etc., are beneficial. The child should be kept clean and dry, regularly exercised, and allowed to enjoy a pure bracing air, that of the seaside being specially beneficial. The food should be nutritious and easily digestible.

**RICKETTS,** rĭk'ĕts, **James Brewerton,** American military officer: b. New York, 21 June 1817; d. Washington, D. C., 22 Sept. 1887. He was graduated from West Point in 1839, served in the Mexican War, where he was engaged at Monterey and at Buena Vista, was promoted captain in 1853, and fought in the Seminole War in Florida. He afterward served on the Texas frontier until the outbreak of the Civil War, when he assisted in the defense of Washington and the capture of Alexandria. He participated in the first battle of Bull Run where he was made prisoner but on his release in 1862, he was brevetted brigadier-general of volunteers. He commanded a division at Chantilly, South Mountain and Antietam, in 1863 received promotion as major of artillery in the regular army, was in command of a division in the Richmond campaign, and fought in the engagements from the battles of the Wilderness to the investment of Petersburg. In 1864 he served under Sheridan in the pursuit of Early's army. He was brevetted major-general in the regular army in 1865, and in 1865–66 was in command of a district in Virginia. He was mustered out of the volunteer service in 1866, and in 1867 retired from active duty.

**RICKETTS, Palmer Chamberlaine,** American engineer and educator: b. Elkton, Md., 17 Jan. 1856. He was graduated at the Rensselaer Polytechnic Institute in 1875 and was appointed to the teaching staff there, becoming professor of technical mathematics in 1884, and president and director in 1901. He is known as a consulting engineer for railroads and corporations; and is vice-president of the American Society of Civil Engineers. Author of ‹History of Rensselaer Polytechnic Institute› (1895), and of papers for technical journals.

**RICKMAN,** rĭk'mạn, **Thomas,** English architect: b. Maidenhead, Berkshire, 1776; d. March 1841. He developed a taste for architectural drawing, and having sent in a design for a church that proved successful in a government competition, he settled at Birmingham as an architect. He built a number of Gothic churches and chapels in Birmingham, Hampton, Lucy, Bristol, Preston, Carlisle, etc., many country houses, and the new buildings of Saint John's College, Cambridge. He is the author of ‹Attempt to Discriminate the Styles of Architecture in England from the Conquest to the Reformation› (1817).

**RICO,** rē'kō, **Martin,** Spanish painter: b. Madrid, about 1850; d. 1908. He studied under Frederico de Madrazo, and later in Paris and Rome. He was elected a member of the Legion of Honor in 1878. His works are well known in America where he is represented in many collections, both public and private, and present architectural subjects chiefly. Among his works are ‹Doge's Palace in Venice› (Samuel Hawk Collection, New York); ‹Italian Garden› (Metropolitan Museum); ‹Court Interior–Granada› and ‹On the Seine› (Morris K. Jessup Collection, New York); ‹Canal Near Poissy› (A. J. Drexel, Philadelphia); ‹Entrance to Canale Grande, Venice›; ‹Bridge of Toledo›; ‹Gathering Oranges, Toledo› (Walters' Gallery, Baltimore); ‹Banks of the Adige› (Corcoran Gallery, Washington), etc.

**RICO,** Colo., town and county-seat of Dolores County, on the Rio Grande Southern Railroad, 140 miles southwest of Leadville and on Dolores River. The first settlement was made in 1867 and a new settlement in 1877, both by mining prospectors; the town was incorporated in 1879, and became the county-seat on the organization of the county in 1881. It is in a region rich in gold, silver, copper and iron, and the chief industry is the mining and milling of these ores. The town contains a bank, a hose-house and the county courthouse. It has a graded public school. The government is vested in a mayor, elected annually, and a council of six members, three elected each year. Pop. 500.

**RICORD,** rĭk'ôrd, or **RICARD, John,** American lawyer: prominent in Hawaiian affairs in 1843–47. He is stated by some authorities to have gone to Hawaii from Oregon while others speak of him as a young lawyer who arrived from New York. He reached Hawaii in October 1843, was appointed attorney-general in 1844, and in 1845, by request of the legislature, he prepared three bills which were practically amendments to the constitution, providing for the establishment and defining of the duties of an executive department of the government and also for a judiciary independent of the executive branch of the government. Regular cabinet departments were established, the Premier being Minister of the Interior, while other departments were foreign affairs, finance, public instruction and attorney-general. As far as was practicable Ricord sought to establish the common law of England in the islands, and the statute laws drafted by him and passed by the legislature remain in a large measure still in force. He left the islands in 1847.

**RICORD,** rē-kôr, **Philippe,** French physician: b. Baltimore, Md., 10 Dec. 1800; d. Paris, France, 22 Oct. 1889. He went to Paris in 1820, where he was granted his medical degree in 1826, practised in the provinces for two years, and on his return to Paris passed the Concours examination, and was appointed a surgeon at the Pitié Hospital. In 1831 his lectures in surgery secured his appointment as surgeon-in-chief at Hôpital des Veneriens du Midi, an office he continued to fill until 1860, when he resigned and engaged in private practice. In 1862 he was appointed physician in ordinary to Prince Napoleon, and in 1869 consulting surgeon to Napoleon III. He was made commander of the Legion of Honor in 1860, and for his services in the ambulance corps during the siege of Paris was made grand-officer of the Legion in 1871. He was the author of various valuable surgical treatises and invented several surgical instruments.

**RIDDLE, Albert Gallatin,** American lawyer and author: b. Monson, Mass., 18 May 1816; d. Washington, D. C., 15 May 1902. He removed with his father, to Geauga County, Iowa, in 1817, studied law, and was admitted to the bar in 1840. He was elected to the legislature in 1848 and in that year called the first Free-Soil Convention in Ohio. He removed to Cleveland in 1850, was elected prosecuting attorney in 1856 and in 1859 he defended the Oberlin slave rescuers. He served in Congress in 1861–63 and was then appointed United States consul at Matanzas. From 1864 he was engaged in law practice at Washington, D. C. He was one of the lawyers retained by the government for the prosecution of John H. Surratt for the murder of President Lincoln. He served as law-officer of the District of

Columbia from 1877; and for several years after its establishment he was in charge of the law department at Howard University. Author of ‹Students and Lawyers› (1873); ‹Alice Brand: A Tale of the Capital› (1875); ‹Life of James A. Garfield› (1880); ‹The Sugar Maple of the West Woods› (1885); ‹Life of Benjamin -Wade› (1886); ‹Recollections of War Times, 1860–65.›

**RIDDLE,** rĭd'l, **Matthew Brown,** American theologian: b. Pittsburgh, Pa., 17 Oct. 1836; d. 1 Sept. 1916. He was graduated from Jefferson College, Pennsylvania, in 1852, and from the New Brunswick Theological Seminary in 1859. He was adjunct professor of Greek at Jefferson College in 1857–58, was pastor of the Dutch Reformed Church, Hoboken, N. J., 1861–65, and of the Second Reformed Church, Newark, N. J., 1865–69. In 1871–87 he occupied the chair of New Testament exigesis at Hartford Theological Seminary, Conn., and from 1887 filled that chair at the Western Theological Seminary, Allegheny, Pa., until he retired in 1913. He was a member of the American Committee for New Testament revision, an editor of the Standard edition of the Revised Version, and was a revising editor on the Standard American Revised Version of the New Testament (1901). He was one of the editors of Lange's ‹Commentary›; ‹International Commentary›; ‹International Revision Commentary.› and Myer's ‹Commentary›; edited Robinson's ‹Greek Harmony of the Gospels› (1885); Vols. VII, VIII, ‹Ante-Nicene Fathers› and Vols. VI, X, ‹Nicene and Post-Nicene Fathers› (1886).

**RIDDLE,** any sentence or composition with an intentionally double or veiled meaning, which is propounded for another to discover the meaning. A riddle may either have an apparent sense which serves as a disguise to the real one, or it may be in the form of a question, the terms of which do not directly indicate the nature of the answer required. Riddles naturally divide themselves into two classes: plays upon words, which are otherwise called conundrums; and allegorical or fanciful descriptions of or allusions to the subject on which the riddle is founded. The latter is called an enigma. It is the more ancient and serious form of the riddle. Enigmas, or dark sayings, were frequently used by the ancients to disguise important truths, which it was not deemed safe or advisable that everyone should know. Kings sent enigmas to each other, ambassadors delivered their messages in this form, and the oracles of the gods were frequently conveyed in the form of an enigma. In modern times serious enigmas have been elaborated in prose and verse, particularly the latter, in all civilized languages. They are in general mere elaborate trifling, and are commonly as dull as they deserve to be.

Among the most celebrated examples of ancient riddles is that propounded by the Sphinx, and answered by Œdipus, What animal is that which goes on four feet in the morning, on two at midday, and on three in the evening? The answer is Man, because he goes on all fours as a child, on two feet as a young man, and with a staff in old age. The punning variety of riddle, though sometimes indulged in by the Greeks and Romans, is of comparatively modern growth. It is a great favorite in festive gatherings of juveniles. Sometimes strings of puns are linked together with considerable ingenuity in the more complex riddles of this description, as in the following instance. What wind does a hungry sailor like best? One that blows fowl and chops, and then comes in little puffs. The earliest collection of riddles known to have been published is entitled ‹Demands Joyous,› printed in 1511. The first French collection was published in Paris by Gille Beys in 1582.

**RIDEAU-OTTAWA CANAL SYSTEM.** See CANADIAN CANALS.

**RIDEING,** rīd'ĭng, **William Henry,** American editor: b. Liverpool, England, 17 Feb. 1853; d. 23 Aug. 1919. He came to the United States and lived in Chicago until 1870, after which he was engaged in journalism in various American cities. After 1882 he was associate editor of the *Youth's Companion,* and in 1887–99 was associate and managing editor of the *North American Review.* He published ‹Scenery of Pacific Railways› (1878); ‹Thackeray's London› (1885); ‹In the Land of Lorna Doone› (1895); ‹At Hawarden with Mr. Gladstone› (1896); ‹How Tyson Came Home› (1904), and ‹Many Celebrities,› a book of reminiscences of a very varied life, 1912.

**RIDERS,** in national or state legislation, the additional provisions of a bill under the consideration of a legislative assembly, having little connection with the subject matter of the bill. Sometimes riders are attached to important and particularly to appropriation bills, in order to obtain their passage, as by themselves they would be likely to incur an executive veto, while as a part or proviso of an important bill they are absorbed in the main subject, and so avoid the «veto» and the «table.» It has been proposed frequently that the Constitution of the United States be so amended that the President could veto single objectionable items without affecting the main purpose of bills.

**RIDERS TO THE SEA,** by John Millington Synge, is the most nearly perfect tragedy in one act in modern literature. The very simple plot is based not on the traditional conflict of human wills but on the hopeless struggle of man against the impersonal but relentless cruelty of the sea. It has taken from Maurya four of her six sons, their father, and their father's father. The fifth son is missing and her daughters get proof that he too has been drowned while Maurya is entreating Bartley, the last of them all, not to ride his horses down to the boat for the Connemara fair. «If it was a hundred horses, or a thousand horses you had itself, what is the price of a thousand horses against a son, where there is one son only?» But Bartley will not listen, and when the sea swallows him too, the tragedy of the mother's previous revolt pales before the utter tragedy of her resignation. «They're all gone now and there isn't anything more the sea can do to me. . . . I won't care what way the sea is when the other women are keening.» In all of Synge's plays except ‹Deirdre of the Sorrows,› one can trace his inspiration to his stay in the Aran Islands,— usually to a story he has heard on the road or by the turf fire — but in ‹Riders to the Sea› we have the most direct transcript of his own sympathetic knowledge of the people and conditions of those wind-swept, sea-swept isles where life seems only the sweeter for being purchased by daily struggle with barren soil and warring elements. In this struggle it is inevitably the mothers who lose out. «The maternal feeling is so strong in these islands,» Synge writes, «that it gives a life of torment to the women.» The contrast between ‹Riders to the Sea› and ‹The Playboy of the Western World› indicates the gamut of Synge's genius. The former is as remarkable for the exquisite consistency of its theme, treatment and atmosphere as the latter is for its variety and its piquant contradictions; the one almost defies criticism, the other challenges it. ‹Riders to the Sea› was first produced by the Irish National Theatre Society at Molesworth Hall in Dublin on 25 Feb. 1904. It was in the repertory of the Irish Players on tour in the United States in 1912–13. Consult Synge, J. M., ‹The Aran Islands›; id., prefaces to ‹The Playboy of the Western World› and ‹The Tinker's Wedding›; Bickley, Francis, ‹John Millington Synge›; Boyd, Ernest, ‹Contemporary Drama in Ireland›; Howe, P. P., ‹John Millington Synge›; Weygandt, Cornelius, ‹Irish Plays and Playwrights.›

**RIDGAWAY,** rĭj′ạ-wā, **Henry Bascom,** American Methodist Episcopal clergyman and educator: b. Talbot County, Md., 7 Sept. 1830; d. Evanston, Ill., 3 March 1895. He was educated at Dickinson College, engaged for several years as a pastor, and in 1882 was appointed professor of historical theology at Garrett Biblical Institute. In 1884 he became professor of practical theology there, a position he held until his death, serving also as president of the institute. Author of ‹Life of Alfred Cookman› (1871); ‹The Lord's Land; Travels in Sinai and Palestine in 1873–74› (1876); ‹Life of Bishop Edward S. Janes› (1882); ‹Bishop Matthew Simpson› (1885), etc.

**RIDGE,** rĭdj, **John,** Cherokee Indian leader: b. northern Georgia, about 1801; d. 22 June 1839. His early education was begun in the schools conducted among the Cherokee people by the Moravian missionaries. In 1818, at the instance of the American Board of Commissioners for Foreign Missions, he was selected with two other Cherokee youths to attend school at Cornwall, Conn. While there, he became acquainted with Miss Sarah B. Northrop, a member of a prominent local family, whom he afterward married. With his father (Major Ridge) and his cousin (Elias Boudinot) he took an active part in the agitation for the removal of the Cherokee people to the West and was one of the signers of the treaty of New Echota, under which it was finally accomplished. In revenge for this radical action, his death was plotted with that of other members of the Treaty party, by some of the ultra conservative full-blood members of the faction which was opposed to removal. He was a talented man, of strong personality and winning address. So pronounced was his persuasive eloquence that those who plotted his death especially charged his assassins to permit no words of parley with him lest he dissuade them from their fell purpose. He was stabbed to death at his home.

**RIDGE, Major,** Cherokee chief: b. Highwassee, present State of Georgia, about 1771; d. Cherokee reservation, 22 June 1839. He became a councilor and one of the leaders of the Cherokee nation. He favored the deportation of the Cherokees from the Georgia reservation to one westward of the Mississippi, and was murdered, presumably, by some of the opposing party.

**RIDGE, William Pett,** English novelist: b. 1860, Chatham, Kent. He was educated at the Birbeck Institute in London. He began to write in 1890, and among his published works are ‹The Second Opportunity of Mr. Staplehurst› (1896); ‹A Breaker of Laws› (1900); ‹Outside the Radius› (1900); ‹Lost Property› (1902); ‹Mrs. Galer's Business› (1905); ‹Splendid Brother› (1909); ‹The Happy Recruit› (1914); ‹The Kennedy People› (1915). He is best known for stories of a humorous character.

**RIDGEFIELD,** rĭdj′fēld, Conn., town in Fairfield County, on the New York, New Haven and Hartford Railroad, about 60 miles northwest of New York, and 13 miles north by west of Norwalk. It is in an agricultural region, and is a favorite summer resort for residents of New York. The chief industries which contribute to the prosperity of the town are farming, dairying, the grinding of feldspar, and the manufacturing of ice-cutting tools. The most prominent public building is the public library, presented to the town by James Morris of New York, in memory of his wife, Elizabeth W. Morris. There are four churches, good public schools, and one private school. The government is administrated by a board consisting of a warden and burgesses, six members, elected annually in May. Pop. (1920) 2,707.

**RIDGETOWN,** Canada, town in the County of Elgin, province of Ontario, on the Michigan Central Railroad, about eight miles from Lake Erie and 65 miles east of Windsor. It is in an agricultural region, and has some manufacturing interests.

**RIDGEVILLE,** rĭdj′vĭl, Ind., town in Randolph County, on the Mississinewa River, and on the Pittsburgh, Cincinnati, Chicago and Saint Louis and the Grand Rapids and Indiana railroads, about 60 miles south of Fort Wayne and 90 miles northeast of Indianapolis. It is in a fertile agricultural region and is the trade centre for the northern part of the county. It has several industries connected chiefly with farm products and stock raising. It has good public schools, several private schools and a public library. Pop. about 1,300.

**RIDGEWAY, William,** British archæologist: b. King's County, Ireland, 1853. He was educated at Trinity College, Dublin, and at Cambridge University. He was appointed professor of Greek at Queen's College, Cork, in 1883; and from 1892 was professor of archæology at Cambridge. He was Gifford lecturer in natural religion at Aberdeen in 1909–11; Stokes lecturer on Irish archæology at Dublin in 1909; Hermione lecturer in art at Dublin, 1911; and president of the Royal Anthropological Institute in 1908–10. He has also been Brereton Reader in classics at Cambridge since 1907 and is a Fellow of Caius College. Author of ‹Origin of Metallic Currency and Weight Standards› (1892); ‹Homeric Land System› (1907); ‹The Origin of Tragedy› (1910);

‹Minos the Destroyer› (1910); ‹The Dramas and Dramatic Dances of non-European Races› (1915).

**RIDGEWOOD,** N. J., village in Bergen County, on the Erie Railroad, about 21 miles north of New York. The railroad divides the village into eastern and western sections. The village is in a residential locality; the western side is built up with fine residences, most of them the homes of men doing business in New York City. The eastern section of the village spreads out into the Paramus Valley, through which flows the Saddle River. In this part are substantial dwellings with extensive grounds. There are no manufactories. The business blocks and fraternal society buildings are mostly of limestone and pressed brick. There are several churches, public schools and one private school for boys. In 1918 the village erected one of the finest high schools in the State; and the new railway station and plaza, financed conjointly by the village and the Erie Railroad, is a most artistic and attractive recent improvement. There are lodges of nearly all the chief fraternal societies and a large number of social and charitable organizations. Located here is the House of Divine Providence for Incurable Patients, in charge of the Sisters of Charity. The water supply is furnished by the Bergen County Aqueduct Company. The roads in the vicinity are excellent, and the scenery in general, together with the numerous groves and small streams, make it a most charming locality. In the vicinity are many points of historic interest, their histories dating back to pre-Revolutionary days. The value of all taxable village property is $8,500,000. The government is on the commission plan. The receipts and expenses average yearly about $245,000. Pop. (1920) 7,540.

**RIDGWAY,** rĭdj'wā, **Robert,** American naturalist: b. Mount Carmel, Ill., 2 July 1850. He was zoologist to the United States geological exploration of the 40th parallel under Clarence King in 1867–69, and since 1880 has been curator of the division of birds in the National Museum at Washington. He was one of the founders in 1883 of the American Ornithologists' Union, of which he later became president. He was appointed a member of the committee at the first International Ornithological Congress at Vienna in 1885, and of that at Budapest in 1891, and the advisory council of World's Congresses at the World's Columbian Exposition. He is author of ‹A Nomenclature of Colors for Naturalists› (1886); ‹Manual of North American Birds› (1887); ‹Birds of North and Middle America› (1901–16, of which 7 vols. have been issued); ‹Color Standards and Color Nomenclature› (1912); joint author with Prof. Spencer F. Baird and Dr. T. M. Brewer of ‹A History of North American Birds› (3 vols., 1874) and ‹Water Birds of North America› (2 vols., 1884); ‹Ornithology of Illinois› (2 vols., 1889); ‹Nomenclature of North American Birds› (1881); and several hundred separate papers on ornithological subjects. He is a member of the American Forestry Association, Biological Society of Washington, Boston Society of Natural History, National Geographic Society, National Institute of Social Sciences, Philosophical Society of Washington and Washington Academy of Sciences; corresponding member of the Academy of Natural Sciences of Philadelphia, Boston Society of Natural History, Boston Zoological Society, Chicago Academy of Sciences, Davenport Academy of Sciences, Manchester (England), Literary and Philosophical Society, Michigan Ornithological Club, New York Academy of Science and Zoological Society of London; honorary member of the British Ornithologists' Union, German Ornithological Society, Nuttall Ornithological Club and Royal Australian Ornithological Society.

He has traveled extensively in North America while engaged in ornithological exploration; two years' field work in California, Nevada and Utah (1867–69); a summer along the coast of Alaska as guest of the Harriman Alaska Expedition in 1899; two trips to Costa Rica (six months in 1905, three months in 1907) as guest of Señor Don José C. Zeledón, of San José; several trips to Florida, etc.

**RIDGWAY,** Pa., borough, capital of Elk County, on the Clarion River, and on the Buffalo, Rochester and Pittsburgh and the Pennsylvania railroads, about 150 miles northeast of Pittsburgh and 115 miles southeast of Erie. It is in a region devoted mainly to lumbering and agriculture. The chief industrial establishments are lumber mills, sash, door and blind factories, flour and grist mills, machine shops, engine and boiler works and dry kilns. There are other manufactories producing mining materials, proprietary medicines and tobacco products. The educational institutions are public and parish elementary schools, a public library and a private business school. Pop. (1920) 6,037.

**RIDING AND DRIVING.** See HORSES, RIDING AND DRIVING.

**RIDLEY,** rĭd'lĭ, **Nicholas,** English ecclesiastic and martyr: b. about 1500; d. Oxford, 16 Oct. 1555. He was graduated from Cambridge in 1521–22, later studied at the Sorbonne, Paris, and at the University of Louvain. Returning to Cambridge he was made proctor to the university, and as such advocated the claims of King Henry VIII to the supreme ecclesiastical jurisdiction in the realm. Through the patronage of Archbishop Cranmer he became one of the king's chaplains; in 1540 he was appointed master of Pembroke Hall, in 1541 canon of Canterbury, and in 1545 an additional canonry of Westminster was conferred upon him. In 1547 he was elevated to the see of Rochester. In 1550, on the deposition of Bonner, Ridley was made bishop of London, and distinguished himself by his tempered zeal in favor of Protestantism, and especially by his liberality and kindness toward the family of his predecessor. In 1553 in a sermon before Edward VI he made an appeal for the destitute London poor, and as a result of subsequent conferences the king and corporation of London determined to build Christ's Hospital, Saint Thomas' Hospital and Bethlehem Hospital. On the death of Edward he was induced to listen to those who attempted to secure the Protestant ascendency by placing the Lady Jane Gray upon the throne. The defeat of this scheme, the active part he had taken in the establishment of the new discipline and the construction of the liturgy, together with his connection with Cranmer, marked Ridley out as one of the most prominent opponents of Queen Mary. He was arrested and sent to the Tower 20 July 1553. In the spring of 1554 he was removed to Oxford, and being brought before the royal commissioners and refusing to recant he was excommunicated. His further trial progressed slowly. The next year Parliament passed penal laws against heretics and under these he was summoned to trial. His condemnation followed upon his admitting the truth of the principal charges against him, and he was burnt at the stake in company with Hugh Latimer.

**RIDPATH, John Clark,** American educator and historian: b. Putnam County, Ind., 26 April 1840; d. New York, 1 Aug. 1900. He was graduated from Asbury University, Indiana, in 1863, and in 1864 was appointed principal of the academy at Thornton, Ind. In 1866 he was superintendent of public instruction for Lawrenceburg, Ind., and in 1867–69 professor of languages at Baker University, Baldwin City, Kan. In 1869 he was appointed to the chair of English at Asbury, and in 1879 became vice-president of the university. The endowment of $2,000,000 bestowed upon the university by Mr. De Pauw was secured largely through Ridpath's efforts, and under his management it received its new name of De Pauw. After his resignation from the university he devoted himself to literature. He was one of the editors of the ‹People's Cyclopædia› (1881) and published ‹Academic History of the United States› (1874–75); ‹Popular History of the United States› (1877); ‹Life of James A. Garfield› (1882); ‹Cyclopædia of Universal History› (1880–84); ‹Great Races of Mankind› (1893); ‹Life and Times of Gladstone› (1898); ‹History of the United States› (1900), etc.

**RIEDESEL,** rē'dĕ-zĕl, **Frederica Charlotte Louisa** (Von Massow): b. Brandenburg 1746; d. Berlin, 29 March 1808. She was the wife of Baron Riedesel (q.v.) and accompanied her husband to America. After Burgoyne's surrender she resided for a year at Cambridge, Mass., where a street has since been named in her honor; and later at Charlottesville, Va. She wrote graphic descriptions of the campaign and subsequent events, published after her death by her son-in-law, Count von Reuss, and translated inadequately into English in 1827 (‹Letters and Memoirs Relating to the War of American Independence, and the Capture of the British Troops at Saratoga›), and worthily by W. L. Stone in 1867 (‹Letters and Journals Relating to the War of the American Revolution›).

**RIEDESEL, Friedrich Adolph,** Freiherr zu Eisenbach, German soldier: b. Lauterbach, Hesse, 3 June 1738; d. Brunswick, 6 Jan. 1800. He studied at the Marburg law school, but before the completion of his course enlisted in a regiment of Hessian infantry as vice-ensign, and soon afterward went to England with his regiment, which had been made part of the British army, and was billeted on a town near London. There he became fairly proficient in English. On the outbreak of the Seven Years' War in 1756, the regiment was sent to Germany and Riedesel served on the immediate staff of Duke Ferdinand of Brunswick. Shortly after the outbreak of the American Revolution, England negotiated with several of the petty sovereigns of Germany for some 20,000 troops. Of these about 4,000 were from Brunswick. Riedesel was promoted major-general and placed in command of the Brunswick contingent, and on 1 June 1776 he reached Quebec. A thorough disciplinarian, he practised his troops in the American mode of fighting, particularly in rapidity of firing, in which the Continentals were much more efficient. He accompanied Burgoyne (q.v.) on the ill-fated expedition of 1777, distinguished himself at Ticonderoga, and at Hubbardton brought up reinforcements and dispersed the Americans. At Freeman's Farm, 19 Sept. 1777, he saved the British from rout by arriving with his Brunswickers; and, after the action on 7 October, had his counsels prevailed, Burgoyne would probably have made a successful retreat to Canada. He was taken prisoner at Saratoga 17 October, exchanged in 1779, and in that year appointed to a command on Long Island. In 1783 he returned to Germany, in 1787 was promoted lieutenant-general, and in 1788 commanded the Brunswick portion of the army sent from Germany to Holland to assist the Stadtholder. From 1794 until his death he was commandant of the town of Brunswick. The ‹Leben und Wirken des General-Lieutenants F. A. Riedesel, nebst vielen Original-Correspondenzen und historischen Aktenstücken,› by von Eelking, appeared in 1856. An abridged translation into English by W. L. Stone was published in 1868. It affords a most complete and accurate account of Burgoyne's expedition, as well as a clear view of contemporary affairs in Canada.

**RIEGER,** rē'gĕr, **Franz Ladislaus,** Baron von, Bohemian statesman: b. Semil, 10 Dec. 1818; d. Prague, 3 March 1903. He studied law at Prague, received a government service appointment and in 1848 he was elected to the Austrian Reichsrat. After a period of activity as one of the leaders of the Slavic party he remained in the background until 1861, when with Palacky he led a movement demanding the restoration of the Bohemian monarchy, including Moravia and Silesia, and that Bohemia should occupy in the empire a place similar to that of Hungary. Reiger's power was gradually encroached upon by the Young Czechs, he remaining the head of the Old Czechs, and in 1891, after 30 years of leadership, he was defeated by the young party. He was ennobled in 1897 and took his seat in the Austrian House of Peers.

**RIEGO Y NUNEZ,** rē-ā'gō ē noo'nyăth, **Rafael del,** Spanish revolutionist: b. Santa Marìa de Tuña, 24 Oct. 1785; executed, Madrid, 7 Nov. 1823. He studied law at Oviedo, entered the army in 1807 and was in command of a battalion at the time of the French invasion of 1808. He was taken prisoner at the battle of Espinosa de los Monteros in November 1808 and was held a prisoner in France until 1814, when he escaped. He visited Switzerland, Germany and England and then returned to Spain through the aid of the English. He remained in the army and in 1820 became the leader of the revolutionary movement which secured the restoration of the Cortes constitution of 1812. He was placed in command of the forces in Aragon as field marshal and captain general, but was discontented with the appointment, feeling that his services deserved high place in the new government.

He was elected to the Cortes in 1822 and chosen its president, 17 Feb. 1823. He met the French invasion with considerable determination but was taken prisoner after several unsuccessful actions, then fell into the hands of royalist volunteers, by whom he was taken to the capital and executed. His revolution failed to benefit Spain as he was unable to keep the forces he had released under control and the country suffered severely between the intrigues of royalty and the uncontrolled conduct of Riego's followers. Spain's popular revolutionary song, the 'Hymn of Riego' was named for him. Consult Riego, 'Memoirs of Riego and His Family' (1824); Baumgarten, H., 'Geschichte Spaniens' (1865–71).

**RIEL**, rē-ĕl', **Louis**, Canadian insurgent: b. Saint Boniface, Manitoba, 23 Oct. 1844; d. Regina, Northwest Territory, 16 Nov. 1885. He belonged to the Métis race of Franco-Indians and as protégé of Archbishop Taché, was educated at the Jesuit College at Montreal. In 1869 he took part in the protest raised by the native tribes against the establishment of Canadian authority in the territories lately acquired from the Hudson Bay Company and was elected president of a provisional government established at Fort Garry. The rebellion was suppressed the next year by a force under Sir Garnet Wolseley and Riel fled from the territory. In 1873 he was elected to the Dominion parliament for Provencher, but was not permitted to take his seat and after two subsequent re-elections a warrant of outlawry was issued against him and he was sentenced in 1875 to five years' banishment with forfeiture of political rights. In 1884–85 he headed a party of half-breeds in another insurrection, which was soon suppressed. Riel was taken prisoner, convicted of treason and executed. See RIEL'S REBELLION.

**RIEL'S REBELLION**, or the Northwest Rebellion, was an outbreak of the half-breeds and Indians of the valley of the Saskatchewan, in the spring of 1885, promptly suppressed by the Canadian militia. For some time past discontent had been rife among the half-breeds, or Métis, of that district, who feared that the surveying of the country by the Dominion government and the government sales of land to incoming settlers would dispossess them of their homesteads. In June 1884 Louis Riel, the half-breed leader of the abortive outbreak of 1869–70, returned by invitation from Montana and put himself at the head of the movement. At a gathering at Saint Laurent, on the Saskatchewan, September 1884, a «Bill of Rights» was adopted asking that the half-breeds should receive the same grant of 240 acres per capita that had already been given (1870) to their kinsmen in the province of Manitoba. With this demand were coupled more extravagant pretensions to further reservations of land and grants of money. Various petitions had already been sent to the Dominion government in behalf of the half-breed claims. A commission had been appointed to consider them, but the whole matter aroused so little public attention in Canada that the news of the actual revolt in March 1885 came with alarming suddenness. On the 17th of that month the Métis formed a provisional government, with Louis Riel (q.v.) as president, Gabriel Dumont as adjutant-general, and a numerous council. All obtainable stores were seized, supplies on the way to Prince Albert intercepted and the telegraph wires cut. At the same time every effort was made to arouse the Indians of the Saskatchewan district, detachments of whom, under Beardy and One-Arrow, at once joined the rebels. The only forces immediately available to cope with the outbreak were about 500 mounted police, scattered in small detachments over the Northwest Territory, of whom some 200 men of all ranks were distributed between Prince Albert, Fort Carlton, Battleford and Fort Pitt. The rebels demanded the surrender of Fort Carlton, a mounted police post on the North Saskatchewan, 40 miles above Prince Albert, held by Major Crozier with a handful of men. Crozier refused, and succeeded in communicating with Prince Albert and obtaining a reinforcement of 40 volunteers. With the help of these he attempted (26 March) to secure the stores from Duck Lake, a post a few miles distant. Here occurred the first bloodshed of the rising. The rebels attacked Crozier near Duck Lake, and forced him to retire to Carlton with a loss of 12 killed and 12 wounded. The mounted police burned the fort at Carlton and retired to Prince Albert. The news of the fight at Duck Lake occasioned intense excitement throughout Canada. Immediate steps were taken to despatch an adequate force of militia to the northwest. General Sir Frederick Middleton, the commander-in-chief, was already on his way. On the 28th of March there was a general call to arms of the militia forces, picked troops from the different regiments being at once forwarded to the front. Various corps of scouts, rangers, cavalry, etc., were specially organized. Eighteen hundred troops started from Ontario and Quebec within six days of the call to arms, and within a month 3,000 men had been transported to the northwest and 1,500 raised in Manitoba and the territories. The area of operations was the valley of the Saskatchewan River, whose north branch runs from west to east through the province of the same name and now in the territories of the Canadian Northern and Grand Trunk Pacific railways. On this river were the posts of Prince Albert, Battleford, situated about 160 miles farther up the river, and Fort Pitt, also on the river, 120 miles northwest of Battleford. The main body of rebels had established themselves at Batoche, on the South Saskatchewan, a river flowing from the southwest to meet its confluent on a long V-shaped angle. Mustering his forces at Qu'Appelle and Swift Current, Middleton resolved to strike into the rebel territory in two columns. The main column, under Middleton, was to move northward on Clark's Crossing, a ferry station on the Saskatchewan about 40 miles by trail from Batoche. A second, under Lieutenant-Colonel Otter, was to march from Swift Current (140 miles west of Qu'Appelle) to the relief of Battleford. A third force, gathered at Calgary, was to descend the route of the North Saskatchewan from Edmonton, thus reaching Fort Pitt. Meantime the position of affairs appeared extremely critical. Some 500 Indians in the neighborhood of Battleford had risen under Poundmaker, a Cree chief, laid siege to the stockade fort in which the whites had taken refuge, and plundered the stores of the town. Near Fort Pitt the Indians had also risen under Big Bear, and at Frog Lake, a post about 30 miles distant, on Good Friday (3 April) they plundered the stores and shot down nine persons in cold blood. The news of the massacre spread terror throughout the unprotected valley of the upper river, the settlers fleeing toward Edmonton. Many of the deserted houses were looted and burned. The advance was carried out with admirable success. The main column, the Royal Grenadiers, A Battery and other troops, traversing in forced marches 177 miles of prairie, struck the South Saskatchewan at Clark's Crossing. Advancing northwards down the river, they came upon the rebels strongly posted in a wooded ravine called Fish Creek, in which they had constructed rifle pits. A sanguinary contest ensued (23 April). The rebels, led by Gabriel Dumont, defended themselves stubbornly, but were ultimately dislodged. The loss of the militia was 10 killed and 40 wounded. The second column, under Otter, consisting chiefly of Queen's Own men, left Swift Current 13 April, and after a march of 202 miles successfuly relieved the beleaguered fort at Battleford. From there Colonel Otter determined to strike at Poundmaker's reserve, against which he moved on 1 May, with a force of 325 men and three guns. They came upon the Indians in force at Cut Knife Hill, and after a severe engagement were compelled to retire on Battleford, with a loss of 8 killed and 14 wounded. At the same time General Strange, with the third division, marched from Calgary to Edmonton (2 May), and thence directed his forces against Big Bear. Meanwhile General Middleton decided to move forward against the main body of the half-breeds at Batoche. The advanced season rendered possible the navigation of the South Saskatchewan, down which the steamer *Northcote,* with supplies and munitions, was despatched to join Middleton's column. Batoche was invested by the militia on 9 May, and a four days' fight ensued. The rebels were entrenched in rifle pits along the banks of the river. During the first three days the fighting was desultory, Middleton using his artillery and throwing up earthworks in order to exhaust the ammunition of the half-breeds without unduly exposing his men. The *Northcote,* that was to have aided in the attack, steamed down the river under a hot fire on the 9th, but its steering gear being disabled, it drifted past Batoche. On the fourth day a general charge of the militia resulted in a complete victory. The rifle pits and the village of Batoche were taken by storm and Riel and many of his council captured. Dumont escaped to the United States. The loss of the Canadian forces in the four days was 8 killed and 46 wounded; that of the rebels, 51 killed and 173 wounded. With the storming of Batoche the rebellion was virtually at an end. Poundmaker capitulated, and Big Bear fleeing to the north, though offering fight at Frenchman's Butte and Loon Lake, was ultimately captured (2 July). Riel was taken to Regina, where he was tried for treason-felony (July 1885). His counsel attempted to defend him on the ground of insanity, but the plea was unavailing, and he was sentenced to be hanged. Numerous petitions were sent from French Canada in favor of commutation of his sentence, with equally urgent petitions to the contrary from various parts of the Dominion. He was hanged at Regina 16 Nov. 1885, meeting his death with great fortitude. Eight Indians were shortly after hanged at Battleford for complicity in the murders at Frog Lake, Fort Pitt and other places. Poundmaker, sentenced to three years' imprisonment, died in the Manitoba penitentiary. For further information consult the ‘Official Report on the Suppression of the Rebellion, ‘Ottawa’ (1886); ‘Dominion Annual Register’ (1885); ‘Reminiscences Lieut.-Col. Bolton’ (1886), and ‘Canada and Its Provinces’ (Vol. VII, 1914).

Stephen Leacock,
*McGill University.*

**RIEMANN,** rē'mạn, **Georg Friedrich Bernhard,** German mathematician: b. Breselenz near Dannenberg, Hanover, 17 Sept. 1826; d. Selasca, near Iutra, Lago Maggiore, Italy, 20 July 1866. He was educated at the universities of Göttingen and Berlin, taking his doctor's degree with the thesis ‘Grundlagen fur ein allgemeine Theorie der Functionen einer veränderlichen complexen Grosse,’ and establishing therewith a reputation for high mathematical ability. He also made valuable researches in natural philosophy. He became privat docent at Göttingen and in 1857 was appointed adjunct professor of mathematics there, becoming professor after the death of Dirichlet in 1859. His achievements in mathematics included new and highly valuable theories concerning the study of surfaces and functions, and a non-Euclidean system of geometry. His work represents a considerable advance in the science notwithstanding his short life and the fact that in his last years much of his time was absorbed in combating pulmonary tuberculosis, which caused his early death. Author of ‘Ueber de hypothesen, welche der Geometrie zu Grunde liegen’ (1867); ‘Vorlesungen uber Schwere, Elektrizität und Magnetismus’ (1876); his collected works were edited by Weber, H., and Dedekind, R., and include a biographical sketch, ‘Gesammelte mathematische Werke und wissenschaftlicher Nachlass’ (1876; French trans. 1898).

**RIEMANN, Hugo,** German author and music teacher: b. Grossmehlra, near Saundershausen, 18 July 1849. He served in the Franco-Prussian War and later studied at the Conservatory at Leipzig, where in 1878 he became university lecturer on music. In 1880 he removed to Bromberg and in 1881–90 he was teacher of theory and piano at the Conservatory there. He taught at the Conservatory at Wiesbaden in 1890–95. Returning to Leipzig as lecturer in 1895, he became professor of music there in 1901 and director in 1908. He has written much and authoritatively on the teaching and theory of music, and his musical compositions are designed to aid the teaching of music. He has also edited many works of older composers. His most important work is his ‘Musik-lexicon’ (1882; 8th ed., 1916) which attained worldwide recognition. He is also author of ‘Handbuch der Harmonielehre’ (1887); ‘Jahrhundert’ (1898); ‘Handbuch der Musikgeschichte’ (4 vols., 1901–14); ‘Gross Kompositionlehre’ (3 vols., 1902–03).

**RIEMENSCHNEIDER,** rē′mĕn-shnī′dė̃r, **Tilman** (Meister Dill, or Till), German sculptor: b. Osterode, Harz Mountains, about 1468; d. Würzberg, 8 July 1531. He became a resident of Würzberg, was chosen a member of council in 1509 and burgomaster in 1520. He was prominently connected with the Peasants' War and after 1525 he was not permitted to retain his office. He lived thenceforth in retirement. He left numerous works of sculpture, the majority of which are in or near Würzberg. One of his finest works is the monument to Emperor Heinrich II and his consort Kunigunde, in the Bamberg Cathedral, finished in 1513. The figures of the emperor and his wife are somewhat more than life size and are regarded as excellent portraits besides furnishing an authoritative representation of the 15th century costume. The church at Rimpar, near Würzberg has some 20 statues by Riemenschneider. A group, ‘Lamentation over the Dead Christ,’ is in the church at Heidingsfeld, and there is a high relief of the same subject in the church at Maidbrunn. The latter was executed in sandstone (1525) and is believed to be his last work. He achieved a considerable reputation in foreign countries through his wood carvings and his designs for them. Among them are several beautiful altars. Consult Streit, ‘Riemenschneider’ (Berlin 1888), a monograph with reproductions of all his works.

**RIENZI,** rē-ĕn′zē, **Cola di,** Roman popular leader: b. about 1313; d. 8 Oct. 1354. The son of an innkeeper, he became imbued with a passionate desire to re-establish the glory of ancient Rome on the ruins of the oligarchy under whose rule the people suffered. In 1343 he went to the pope at Avignon, as the representative of the Roman people, and entreated him to return to Rome and end the misrule of the nobles. The pope made Rienzi apostolic notary, and the latter returned to Rome, where he began the organization of a widespread movement for the overthrow of the aristocracy. On 20 May 1347, Rienzi summoned an assembly of the people at the capitol, and there proposed a new constitution for the state, providing for the arming of the people and the garrisoning of the walls by them, the reform of justice and the equitable distributing of taxes. He became head of the new republic with the title of tribune of the people, and by means of the popular levies forced the nobles to leave the city. Rienzi's plans included not merely the restoration of the municipal liberties of Rome, but the re-establishment of the ancient Roman state, and to that end he invited the Italian cities to send representatives to Rome for the consideration of the welfare of Italy. Though few cities responded, Rienzi, carried away by power and his own eloquence, caused himself to be crowned tribune 15 August, and bestowed the Roman citizenship on all inhabitants of Italy. The pope's hostility, however, was aroused by Rienzi's vainglorious attempt to act as arbitrator in the dispute for the Imperial throne that was then in progress, and he stirred up the Roman nobles against him. The nobles were defeated, but, Rienzi, dazzled by success, began to play the tyrant, and a second insurrection compelled him to flee the city (15 December). Later he went to Bohemia to secure the aid of Emperor Charles IV for the execution of his plans. The emperor handed Rienzi over to Pope Innocent VI, who, however, recognized how useful the tribune might be to him in crushing the Roman nobility and therefore sent him to Rome with Cardinal Albornoz in 1354. Rienzi's popularity was still great and he easily regained power; once more, however, he fell a victim to excess, perpetrated acts of outrage and oppression, and aroused the hatred of the people. An insurrection, stirred up by the nobles of the house of Colonna and Sarelli, broke out on 8 Oct. 1354. The mob stormed the capitol, and Rienzi, seized as he was escaping in disguise, was murdered, and his body dragged through the streets. The career of Rienzi is the subject of one of Bulwer-Lytton's novels, ‘Rienzi’ (1835) and of Wagner's opera, ‘Rienzi,’ first produced at Dresden, 20 Oct. 1842. Consult Pappencordt, ‘Cola di Rienzi und seine Zeit’ (1841); Auriac, ‘Étude historique sur Nicole Rienzi’ (1888); Rodocanachi, ‘Cola di Rienzi’ (1888).

**RIENZI, The Last of the Roman Tribunes,** a historical romance by Sir Edward Bulwer-Lytton, published in 1835. It is founded on the career of Cola di Rienzi (q.v.). Bulwer was so impressed with the heroism and force of character of his hero, that at first he meditated writing his biography, instead of a romance founded on his life. The story adheres very closely to the historical facts. Many of the situations and scenes are very strong. The treatment is epic rather than dramatic; and the splendid yet comfortless civilization of the Middle Ages, so picturesque and so squalid, so ecstatic and so base, is vividly delineated. Rienzi is also the subject of a once popular tragedy by Mary Russell Mitford, first published in 1828.

**RIES,** rēs, **Heinrich,** American economic geologist: b. Brooklyn, N. Y., 30 April 1871. He was educated at Columbia University. He served on the New York State Geological Survey in 1891–92 and in 1895, and was assistant in mineralogy at Columbia in 1896–97. He became associated with the faculty at Cornell in 1892, was appointed professor of economic geology in 1905, and since 1914 has been head of that department. Author of ‘Economic Geology of United States’ (1905); ‘Building Stone and Clay Products’ (1912); and joint author of ‘Clay, Occurrence, Properties and Uses, History of the Clay Working Industry of United States’ (1906); and ‘Engineering Geology.’ (1914).

**RIESENGEBIRGE,** rē′zĕn-gė-bē̃r″gė (the Giants' Mountains), part of the Sudetic chain, separating Silesia from Bohemia and Moravia, till it joins the Carpathians. It contains the loftiest mountains of the north or central parts of Germany. Some of the principal summits are Schneekoppe, 5,257 feet high; the Borenberg and the Grand Rad, each 5,156 feet high.

**RIET-BOK,** rēt′bŏk, the Dutch name of a South African species of antelope, *Antilope* (or *Tragelaphus*) *arundinaceus.* It is nearly five feet in length and about three feet high at the shoulder; the horns, about a foot long, are boldly annulated at the base. In color it is of a dull ashy gray, sometimes tinged with red on the upper parts and silvery-gray beneath. As its name (*riet-bok,* reed-buck) implies, it is found mostly among reeds or coarse long grass.

**RIETSCHEL,** rĕch'ĕl, **Ernst Friedrich August,** German sculptor: b. Pulsnitz, Saxony, 15 Dec. 1804; d. Dresden, 21 Feb. 1861. He studied art at Dresden, was a pupil of Rauch in Berlin and later studied in Italy. He gained recognition as a sculptor of extraordinary ability through his colossal statue of Frederick Augustus, king of Saxony, at Dresden. He was elected to the Academy of Dresden and from 1832 until his death he was professor of sculpture at Dresden. He possessed a broad scope and excelled in many branches of his art. He was especially famous for his portrait figures, among which are those of 'Goethe' and 'Schiller' (Weimer); 'Lessing' (Brunswick); and 'Luther' (Worms). His religious pieces include the 'Christ-Angel' and the statue of 'Pietà'; and among his bas-reliefs are 'Night and Morning'; 'Noon and Twilight.' Consult his Autobiography (edited by Oppermann, 1873).

**RIFF,** a name given to the coast districts of northern Morocco extending from Ceuta to the western frontier of Algiers and forming a line of steep cliffs with few harbors. Its Berber inhabitants were formerly much addicted to piracy and are still noted for smuggling.

**RIFLE.** See SMALL ARMS.

**RIFLE CLUBS.** There are more than 1,000 rifle clubs in the United States, affiliated with the National Rifle Association of America, which is managed by the War Department at Washington. The object is to promote good marksmanship. A club must have at least 10 members and a range where they can use .22 calibre rifles. Such ranges measure 50 or 75 feet from rifle to target. Civilian clubs usually shoot at 75 feet; but college, military academy and high school clubs usually shoot at 50 feet. If outdoor ranges of 200 yards or more are available, the War Department furnishes military rifles and ammunition. Navy ranges are usually available and these furnish not only rifles and ammunition, but excellent coaching. The regular army and navy courses are used and those who qualify as marksman, sharpshooter, or expert, receive appropriate decorations. With scientific coaching in the indoor range, men with no previous knowledge of the rifle soon learn to shoot well, and seldom fail to make good with the military rifle at longer ranges. Ample information as to organizing clubs, installing ranges, securing guns, ammunition, etc., may be secured by addressing The National Rifle Association of America, 1108 Woodward Building, Washington, D. C.

**RIFLEMAN,** or **RIFLE BIRD,** an Australian forest-bird (*Ptilorrhis paradiseea*), closely related to the birds of paradise and so called because its colors and ornaments reminded the colonists of the old uniform of the British Rifle Brigade. The male is regarded as more splendid in plumage than any other Australian bird. The upper parts are velvety black, tinged with purple; the under parts velvety black, diversified with olive-green. The crown of the head and the throat are covered with innumerable little specks of emerald green of most brilliant lustre. The tail is black, the two central feathers rich metallic green. The female, as is often the case, is much duller colored than her mate. They obtain their insect food largely from beneath the loose bark of trees, about which they scramble like woodpeckers. Consult Newton, 'Dictionary of Birds' (1893–96).

**RIG VEDA,** rĭg vā'dä, the oldest of the four Vedas, and the oldest literary monument of the Indo-European races. The term Veda is the ancient Hindu Sanskrit word for knowledge, and the Vedas compose the great body of sacred scripture of the older Hindus, written in an ancient form of Sanskrit. The precise time of composition of the Vedas cannot be determined, but it is probable that the Rig Veda was in course of composition as early as 1200 B.C., and some authorities contend that some of the verses must have been composed as early as 1500 B.C., the latest date of composition given for any of the verses being 600 B.C. It is known that the Rig Veda was composed by many different generations, and Max Müller believed that for a long period after its composition it was transmitted orally from one to another, and was not set down in writing until a much later date, since it contains no allusion to writing or writing materials. Of the four Vedas the Rig Veda is by far the most important, not only on account of its greater antiquity but also because of the information which it contains. The most authoritative writers state that the sacred hymns of the Rig Veda are repeated in a modified form in the Sâma Veda, or chants, and in another form in the Yajur Veda, or ritual, while the fourth and latest of the Vedas, the inferior Atharva Veda, shows great modifications from the hymns of the Rig Veda, due to the introduction of superstitions, magic chants and vulgar charms. The hymns of the Rig Veda, in common with those of the three succeeding ones, are of four classes; the first and most important are the mantras, or sacred utterances, usually in metrical form; the next are the brahmanas, or explanatory inspired utterances, being the oldest Indo-European bodies of prose; last come the Sutras, divided into three classes, of which two are found in the Rig Veda; the Kalpa-Sutras, comprising largely rules of sacrifice, and the Grhya-Sutras, dealing with home life. The Rig Veda consists of 1,017 hymns or short lyric poems, with 10,580 verses. It is written in 10 books, of which six books ii–vii contain each the record of a single family or clan; book i, 15 collections, each attributed to a different poet-sage; book ix glorifies the sacred drink «Soma,» and book x contains hymns supposed to have been composed by many different authors. The religion was nature worship, the chief objects of adoration being Agni, the god of fire, and Indra or Jupiter Pluvius, the cloud-compeller. The Hindu Triad had not yet arisen. The Rig Veda does not recognize the institution of caste. Beef was eaten. Women held a high position, and some of the hymns were composed by them. The rite of suttee was unknown; the conquest of Indra had only begun, and the Ganges, incidentally mentioned, had not become a sacred stream. «The home of the Rig Veda,» says Professor Hopkins, of Yale University, «has been located in almost as many places as Paradise. Now it is by the Caspian Sea, now it is in Kandahar, but the Punjab is the favorite place, and quite naturally; for the poets are familiar with the Punjab, sing of it, talk of crossing its rivers, and in many ways show that they occupied, in part at least, the country stretching from Peshawar to Delhi.» (See SANSKRIT LITERATURE; VEDA). Consult ‹India Old and New: The Rig Veda,› by E. W. Hopkins (New York 1901); ‹The Religions of India,› by the same author (Boston 1895), and the translation by Arrowsmith (Boston 1886) of A. Kaegi's ‹Rigveda.›

**RIGA,** rē′gä, Latvia, capital of Republic on the Dwina, seven miles from the Gulf of Riga, an inlet of the Baltic, is one of the principal seaports of the Baltic. It had a population at the last census of 569,100. Of the four parts into which it is divided, the old town alone preserves the Hanseatic features. It is characterized by high storehouses and spacious granaries; market place; other squares, and busy, winding streets. The Saint Petersburg division of the town is the aristocratic quarter. The «Domkirche» (1204) contains one of the largest organs in the world. Saint Peter's Church has a tower over 400 feet high. The Castle (1494–1515), built by Walter von Plettenberg, is a spacious building now occupied by the military authorities. Other places of more recent construction are: The Polytechnic, Exchange, municipal picture gallery, schools, gymnasiums and scientific and professional colleges, bonded warehouses and manufactories. At least half of the population is German, the German element predominating in the life of the city. There is an ever-increasing intellectual and commercial development. Riga is a great mart for timber from the vast White Forest, and the principal port of Latvia for exports, the chief of which are corn, hemp, oats, tallow, leather, tobacco, rugs and feathers. Much of the interior trade is carried on by both rail and water communications.

**RIGA, Gulf of,** an inlet on the east side of the Baltic Sea, 105 miles in length from north to south and about 60 in breadth. The islands of Ösel, Dagö, Mohn and Worms lie across the entrance. The chief river which falls into the gulf is the Düna; seven miles above its mouth is the important commercial seaport of Riga (q.v.), after which the gulf is named.

**RIGAUD,** rē-gō, **Hyacinthe,** French painter: b. Perpignan, 20 July 1659; d. Paris, 27 Dec. 1743. He arrived at Paris in 1681 and, acting under the advice of Lebrun, began to study portrait painting, taking Van Dyck for his model. In 1700 he became a member of the Academy, of which he was elected professor in 1710 and rector in 1733. His portraits are all extraordinarily successful as likenesses, his heads are full of character, and the figures have all the studied nobleness in attitude characteristic of the times; while he paints the gay costumes of the court with remarkable truthfulness and brilliancy. Among his most notable works in the Louvre are the large portraits of Louis XIV and Bossuet, of which latter a replica or copy is in the episcopal palace at Meaux.

**RIGDON, Sidney,** Mormon leader: b. Allegheny County, Pa., 19 Feb. 1793; d. Friendship, N. Y., 14 July 1876. He was employed in a printing office in Pittsburgh in 1812 when a manuscript entitled ‹The Manuscript Found, or the Book of Mormon› was offered for publication by Samuel Spaulding. The work impressed Rigdon so much that he made a copy of the manuscript before it was returned to the author who died soon after. In 1819 Rigdon became a Baptist preacher and in 1829 made the acquaintance of Joseph Smith, with whom (according to a story denied by the Mormons) he published ‹The Book of Mormon,› transforming it by the addition of various pious phrases from an innocent historical romance into a new bible intended as the foundation of a new sect. He accompanied Smith to the West, assisted in founding the Mormon Church and became one of its presidents. He was one of the originators of the «new revelation» authorizing polygamy, and in 1844 on the death of Smith aspired to the leadership. He refused to acknowledge the authority of Brigham Young, was excommunicated, and returned to the East where he lived quietly until his death.

**RIGG, James Harrison,** English Wesleyan clergyman and educator: b. Newcastle-on-Tyne, 16 Jan. 1821; d. Brixton, 17 April 1909. He was educated at Kingswood School and in 1845 entered the Wesleyan ministry. He was a member of the London school board 1870–76; principal of the Westminster Training College 1868–1903; and a member of the Royal Commission on Education 1886–88. He edited the *Quarterly Review* for 15 years and wrote ‹Principles of Wesleyan Methodism› (1850–51); ‹The Churchmanship of John Wesley› (1868–78–86); ‹Dr. Pusey: His Character and Life-work› (1883); ‹Scenes and Studies in the Ministry of Our Lord› (1902), etc.

**RIGGS,** rĭgz, **Elias,** American missionary and linguist: b. New Providence, N. J., 10 Nov. 1810; d. Scutari, Turkey, 17 Jan. 1901. He was graduated from Amherst in 1829, from Andover Theological Seminary in 1832, was ordained to the ministry and sailed for Greece as a missionary in the same year. He continued his work in Greece from 1832–38, in Smyrna from 1838–53, and from that time was engaged in Turkey. He returned to the United States once, in 1856, for the purpose of publishing his Armenian Bible, and while waiting for the completion of the work taught Hebrew in Union Theological Seminary in 1857–58. The remainder of his life was spent in Turkey. He translated the Bible into Bulgarian, Armenian and Turkish, and published ‹Manual of the Chaldee Language› (1832); ‹Grammar of the Modern Armenian Language› (1847); ‹Grammar of the Turkish Language as Written in the Armenian Character› (1856); ‹Notes on Difficult Passages in the New Testament› (1889), etc.

**RIGGS, John Davis Seaton,** American educator: b. Washington, Pa., 29 Jan. 1851. He was graduated from the University of Chicago in 1878, after engaging in business in Rockford, Ill., in 1869–75. He was principal of the commercial department in Salt Lake Academy, Utah, in 1878–79, of the preparatory department in the old University of Chicago in 1879–86, and joint principal of University Academy, Chicago, 1886–87. In 1887 he organized the Granville (now Doane) Academy of Denison University, Ohio, and was its principal until 1896, when he became president of Ottawa University, Kansas. In 1905–10 he was president of Shurtleff College; traveled in 1910–11; in 1911–13 was district manager of the United

Mercantile Agency of Denver. Since 1913 he has been principal of Wolcott School, Denver. Mr. Riggs is a member of the Kansas State Historical Society, of the National Geographical Society and of the National Institute of Social Sciences. He has published ‹In Latinum› (Cæesar) (1890); ‹In Latinum› (Cicero) (1892), etc.

**RIGGS, Kate Douglas (Smith) (Wiggin),** American author: b. Philadelphia, 28 Sept. 1859. She was graduated at Abbott Academy (Andover, Mass.) in 1878; was the first to organize free kindergartens for the poor of the Pacific Coast. In 1880 she was married to S. B. Wiggin, who died in 1889, and she became the wife of G. C. Riggs in 1895, but continues to use the name of «Kate Douglas Wiggin» as a literary signature. Her reputation as a humorist was made by the sketch ‹The Birds' Christmas Carol› (1888), and has been well sustained by the cleverness in description and dialogue of her succeeding volumes, among them ‹The Story of Patsy› (1889); ‹Timothy's Quest› (1890); ‹Polly Oliver's Problem› (1893); ‹Marm Liza› (1896); ‹Penelope's Progress› (1898); ‹Penelope's Experiences in Ireland› (1901), and ‹The Diary of a Goose Girl› (1902). She also edited the anthology ‹Golden Numbers› (with N. A. Smith, 1902), and various books for children.

**RIGGS, Stephen Return,** American missionary: b. Steubenville, Ohio, 23 March 1812; d. Beloit, Wis., 24 Aug. 1883. He was graduated at Jefferson College, Pa., in 1834, studied at the Western Theological Seminary, Allegheny, Pa., for a year, and was licensed to preach. He was sent as a missionary to the Indians in 1837, first being stationed at Fort Snelling. He set about mastering the Dakota language, and subsequently wrote nearly 50 books concerning the language, customs and history of the tribe. He was later connected with the mission at Lac-qui-parle, established one at Traverse des Sioux in 1843, and in 1854 built a boarding school for Dakota children at Hazelwood. He was chaplain to the government expedition which suppressed the Little Crow insurrection in 1862, and thenceforth divided his time between visits to the missions and his translation of the Bible into the Dakota language, which work was published before his death. Author of ‹A Grammar and Dictionary of the Dakota Language› (Smithsonian Institution 1852; revised. ed., 1883); ‹Forty Years Among the Sioux› (1880), etc.

**RIGGS, William Henry,** American collector of arms and armor: b. New York, about 1838; d. Luchon, France, 31 Aug. 1924. Son of Elisha Riggs, of New York, from his childhood he was an ardent collector. At 15 he began the collection of Indian arms and costumes, and in 1853 he shipped from the Rockies to New York one of the earliest ethnological collections made in that region. This, unfortunately, was destroyed in a warehouse fire. At a school in France he was a fellow student with J. P. Morgan, Sr. (q.v.), and the friendship then formed became lifelong. Possessed of ample means, his association with Morgan crystallized his ambitions as a collector, and he definitely planned to make his collection of arms and armor a national one. He traveled indefatigably in quest of rare and historic objects, and in 1857 settled upon Paris as the headquarters for his collection. His home there became a gathering place for a brilliant coterie of lovers of armor, of whom the emperor was one. His later years were devoted to the arranging and putting into perfect order the great collection which in 1913 he presented to the Metropolitan Museum of Art, and which is now housed there as the Riggs Collection of Arms and Armor (q.v.).

**RIGGS COLLECTION OF ARMS AND ARMOR,** the collection of William Henry Riggs (q.v.), presented to the Metropolitan Museum of Art in 1913 and placed on exhibition there in 1914. The collection was gathered from practically every sale of such objects, private or public, in a period beginning in the early 50's and includes intact some of the most famous collections in Europe. It is particularly rich in articles of historic as well as artistic interest, and the total number of pieces in the collection is about 2,500. These represent the cream of Mr. Riggs' collection, he having possessed at one time some 8,000 objects; but these were sorted, weeded out, many pieces of the commoner sort being exchanged for single objects of greater merit, or sold at public auction. As a private collection it was considered unrivaled. Consult ‹Bulletin of the Metropolitan Museum of Art› (Vol. IX, No. 3, New York 1914).

**RIGG'S DISEASE.** See PYORRHŒA ALVEOLARIS.

**RIGHI,** rē'gē, **Augusto,** Italian physicist: b. Bologna, 1850. He was educated at the University of Bologna and was afterward professor at the universities of Palermo and Padua, becoming professor of experimental physics at Bologna in 1889. He has made important researches in connection with electrical conductivity, resistivity and waves, the polarization of light and the Leeman effect. He was the first to observe the double refraction of electric waves; made a series of experiments to prove the analogy of electric and light waves, and discovered the influence of magnetism over bismuth in connection with resistivity. He carried forward the investigation of electromagnetic waves, his work in this connection greatly facilitating Marconi's achievements in wireless telegraphy. He was elected a fellow of the Academia dei Lincei at Rome, and a senator of the Kingdom. He has written many scientific articles and is author of ‹Die optik elektrischen Schwingungen› (1898); ‹Die Telegraphie ohne Draht› (1903); ‹Modern Theory of Physical Phenomena, Radio-activity, Ions and Electrons› (trans. by A. Trowbridge, 1904); ‹Strahlende Materie und Magnetische Strahlen› (1909); ‹Kometen und Elektronen› (1911), etc.

**RIGHI.** See RIGI.

**RIGHT** is a claim or a title to anything whatever that can be enforced, or a claim to act, possess or enjoy anything, or the use thereof, or it may exist in the nature of a privilege or power. Right has also been legally defined «as that which one has a legal claim to do; legal power; authority, immunity granted by authority.» A legal right is one which is protected by law, and the means of protection is the remedy. The existence of a legal right implies the existence of legal remedy, for one does not exist without the other.

**RIGHT-HANDEDNESS**, the property or condition of being right-handed. The cause is not known. Some contend that it is racial habit, growing out of the left hand being used for unclean purposes and, therefore, not fit for eating, salutation, etc. This has not been proven. Others, like Charles Reade, contend that man should be ambidextrous, and that it is a duty in athletics to preserve the balance between the hands. The propensity in man to use the right hand in preference to the left is by some attributed to the lack of perfect symmetry in the body. If the body could be folded over from a medial line so that each organ of the one side should lie exactly on a corresponding organ of the other, the bodily structure would be highly fitted, in a mechanical sense, for the equal use of either limb, and ambidextral individuals would be the rule. The centre of gravity in the body of the average person is a little to the right of such a medial line. This makes the right side the heavier. From a series of experiments the greater weight has been estimated at about 15 ounces. On this fact is founded the mechanical theory of right-handedness, the predominance of the right hand over the left; or, more generally, of the limbs of the right side over those of the left. The extra 15 ounces, however, may be a result not a cause to right-handedness. The three-lobed right lung is more capacious and receives more air during an inspiration than the two-lobed left lung. The liver during inspiration swings toward the right side, shifting the centre of gravity farther to that side. In violent muscular exertion there is more air proportionally inhaled by the lung of the side which sustains the exertion. Under exertion of the right side the larger lung is better filled than the smaller, and the centre of gravity is removed till it is found in a line passing through the right foot; so that the right leg and foot afford a steadier basis of support than the left would do under similar circumstances. Through the greater use of the right lower limb the right upper limb comes to be preferred. In the case of a light weight, slung on the arm, the equilibrium of the body is better maintained by carrying it on the left side. If the weight be a heavy one, borne on the left shoulder, the burden is really being supported very much by the right limb, owing to the natural curve of the body toward the right side, while sustaining the pressure.

In a very few cases left-handedness has been found to accompany transposition of the viscera. But cases of genuine left-handedness far exceed in number such instances of transposition. Ferrier's researches have proved that when we see with the right eye we see with the left side of the brain. Hereditary left-handedness, if there be such a thing, may be due to the greater development of the right side of the brain. «It is practically certain,» says Bastian, «that the great preponderance of right-handed movements in ordinary individuals must tend to produce a more complex organization of the left than the right hemisphere.» Some think that in the evolution of man right-handedness has probably been a late acquisition. The oldest discovered records of the human race, however, suggest man to have been right-handed. Pre-historic weapons are those of right-handed individuals; many tools, etc., now in use are made for the right hand.

Right-handedness in man appears to be more persistent than the corresponding quality in lower animals. Naturalists, who observe that adult monkeys catch nuts more with the right hand, that the African elephant digs more with the right tusk, or that the Carolina parrot has a preferential claw for grasping, tell us that these habits are subject to exceptions more numerous than those of left-handedness in human beings. Another view of the whole subject is taken by some psychologists, who maintain the probability that the tendency to right-handedness is due to unrecognized spiritual causes, which underlie all phenomena of life. Since we do not know what life is, nor even how and why we are sentient creatures, the problem is wholly beyond our reach, and the ingenious theories only demonstrate man's fondness for speculation.

**RIGHT OF SEARCH.** In international law the right of search is the right of the lawfully commissioned cruisers and war ships of a belligerent power to stop and examine on the high seas the merchant vessels of neutral powers in order to determine whether they are carrying contraband goods, engaging in unneutral service, attempting to run a blockade and the like. It is ancillary to the right of capture, for the liability of ship or goods to capture often can be determined only after an inspection of its papers and an examination of its cargo. This right has long been recognized as one which belligerents are lawfully entitled to exercise. «The right of visiting and searching merchant ships upon the high seas,» said the great English admiralty judge, Sir William Scott, in the case of the *Maria* in 1799, «whatever be the ships, whatever be the cargoes, whatever be the destinations, is an incontestable right of the lawfully commissioned cruisers of a belligerent nation — this right is so clear in principle, that no man can deny it who admits the legality of maritime capture, because if you are not at liberty to ascertain by sufficient inquiry whether there is property that can legally be captured, it is impossible to capture.» The right, however, is one which belongs only to belligerents; it cannot be exercised by insurgents whose belligerency has not been recognized. Likewise, it is limited to merchant vessels and cannot be exercised against public vessels of neutral powers and of course it can be exercised only on the high seas. Neutral vessels under convoy are exempt from search. Nor may it be exercised in time of peace except where the right has been granted by treaty, as it has been done to a limited extent for the purpose of putting an end to the slave trade. The assertion and exercise of such a claim by Great Britain during the early part of the 19th century was vigorously contested by the United States and in 1858 it was definitely abandoned by the British government. There are certain well-recognized rules governing the exercise of the right. The pursuing cruiser may, if it wishes, chase under false colors but before beginning the search the true flag must be hoisted. Resistance to the exercise of the right of search renders the vessel and its cargo liable to capture and condemnation. It is customary to summon the vessel to stop by firing a blank cartridge, as a signal to heave to. This is called the *semonce* or affirming gun. A searching party then goes aboard, examines the ship's papers with a view to verifying its nationality, investigates the nature of the cargo and inquires into the ports of departure and destination. There are well-settled rules regarding the number of men who may constitute the searching party, the number and kind of arms they may take aboard, the manner in which the search shall be conducted, etc. Nearly all prize regulations stipulate that the crew shall be treated courteously and that the vessel shall be subjected to as little delay and inconvenience as possible. If the search reveals the presence of contraband, evidence of an intention to violate a blockade and the like, the vessel may be seized, taken into a home port and placed in the custody of a prize court in order that the validity of the capture may be judicially determined. Otherwise it should be released and allowed to proceed on its voyage. During the Great European War of 1914–17 the American government protested against the action of British cruisers for taking American vessels into distant ports «on suspicion not amounting to evidence» and for detaining them for long periods of time for the purpose of discovering evidence of hostile destination. The American government contended that the right of search could only be exercised on the high seas at the time and place of capture and if the examination did not show the presence of contraband or intent to violate a blockade the vessel should be released. To this protest the British government replied that effective searches at sea under modern conditions was impossible. Modern ships are so large and their cargoes so huge that if the right of search is to be effective it is necessary that the ships be taken into port and the cargoes removed in order that each parcel may be examined or weighed. The evidence in many cases showed that contraband articles like rubber and copper had been packed in bales of cotton and the presence of such articles could be determined only by a more thorough examination than was possible at sea. To take a ship into port, it was argued, was not the assertion of a new belligerent right but rather the adaptation of an existing right to modern conditions of commerce. It has been suggested that the necessity of detention in such cases and with it the ruinous delays to which shippers are exposed might be removed by the adoption of a system of official certification whereby neutral vessels could carry, if they chose, satisfactory assurances that their cargoes consisted only of the goods described in their manifests. In some instances during the war such certificates were in fact issued by the United States customs officials and in other cases by British consuls under whose supervision the cargoes were laden on board, but the British government declined to recognize them as conclusive, on the ground that the certificates afforded no assurance against subsequent augmentation of the cargo at sea. In some cases, it may be remarked, treaties have been concluded between the United States and certain foreign powers providing that certificates of this kind shall be accepted by the contracting parties, if one should be belligerent and the other neutral, as conclusive that the cargo is not contraband.

**Bibliography.**— Aside from the general treatises on international law see Atherley-Jones, ‹Commerce in War,› Chapter V, and Garner, ‹Contraband, Right of Search and Continous Voyage› (*American Journal of International Law,* April 1915, pp. 372 ff).

James W. Garner.

**RIGHT OF WAY,** the right to pass over a certain route or track in going from one place to another. Such a right is a public right of way if enjoyed by everybody; private if enjoyed by a certain person or description of persons (as the residents of a particular farm). Wherever there is a public right of way there is technically a highway, though the phrase is not used in connection with regularly-kept-up public roads, but generally with mere paths, tracts or by-roads. The origin of a public right of way is generally said to be by dedication of it to the public by the owner of the soil.

**RIGHT WHALE,** the most important of the baleen whales. See Whale.

**RIGHTS, Civil.** One of the clearest definitions of an authoritative character declares: «Civil rights are those which appertain to citizenship and which may be enforced or redressed by a civil action. Also a term applied to certain rights secured to all citizens of the United States by the Thirteenth and Fourteenth Amendments of the Federal Constitution, and by congressional action thereunder, and by State legislation.» Bouvier says «these consist of acquiring property, of exercising the paternal and marital powers, and the like.» Civil rights in full are extended in this country to aliens as well as to citizens. All residents alike enjoy such powers which can only be denied under a sentence of civil death. Civil rights have been divided into *absolute* and *relative* rights. *Absolute* rights are those generally considered as inherent to humanity. Of such is the right of personal security permitting of the individual's enjoyment, legally and uninterruptedly, of the use of his limbs, his body, his health and his reputation; the right of his personal liberty, consisting of the power of locomotion, of changing situation, or betaking one's person to other places according to inclination and under no outside direction or restraint, except by due process of law. Under the division *absolute rights* is placed the right of property, allowing the free use, enjoyment, and disposal, all his legally acquired acquisitions, uncontrolled and undiminished, subject alone to the laws of the country. *Relative* civil rights include those which subsist between the people and the government, such as the peoples' right to protection at the hands of the government; the right of allegiance which is due to the government at the hands of the people; the rights of husband and wife, parent and child, guardian and ward, master and servant, reciprocally. Belonging to such *relative* civil rights would appear to be those which Blackstone defines as follows: «The rights of persons that are commanded to be observed by the municipal law are of two sorts: first, such as are due *from* every citizen which are usually called *civil duties,* and, secondly, such as belong *to* him, which is the more popular acceptation of *rights* or *jura.*»

As to precedence of civil rights Bouvier says: «The idea of rights is co-existent with that of authority (or government); both are inherent in man; but if we understand by government a coherent system of laws by which a State is ruled and if we understand by State a sovereign society with distinct authority to make and execute laws, then rights precede government, or the establishment of States. . . .» An accepted judicial decision says, in distinguishing civil from natural rights: «By civil rights, I understand those rights which the municipal law will enforce, at the instance of private individuals, for the purpose of securing to them the enjoyment of their means of happiness. They are distinguished from natural rights, which would exist if there were no municipal law, some of which are abrogated by municipal law, while others lie outside of its scope and still others are enforcible under it as civil law.» Johnson, distinguishing civil from political rights gives the following definition: «A right accorded to every member of a distinct community or nation,» whereas a political right is a «right exercisable in the administration of government,» such as rights of voting on elections. «Civil rights . . . have no relation to the establishment, support, or management of the government,» Bouvier says. Certain apparently inherent rights of the citizens may not be *actual* rights so far as the laws of the country are concerned. Thus some rights, termed often *rights of privacy*, such as «one's right to one's face,» the prohibition of holding of a private citizen's character up to ridicule, etc., found no place in court. The former case seems to make legal conditions clear. Until quite recent legislation no redress was available in repeated attempts to hinder the use of portraits of living persons for use in advertising, etc., without that person's consent. But under present legislation the usage of a living person's lineaments without obtained permission of the «owner» is illegal and the civil right of the citizen to his own likeness now prevails, whereas the «holding up to ridicule» of the private person's character (except upon proof of malicious intent, libel, etc.), fails still to find a «remedy» in the courts.

**RIGHTS, Declaration and Bill of.** See Bill.

**RIGHTS, Legal.** Bouvier says legal rights «are those where the party has the legal title to a thing; and in that case his remedy for an infringement of it is by an action in a court of law. Although the person holding the legal title may have no actual interest, but hold only as trustee, the suit may be in his name, and not, in general, in that of the *cestui que trust*.» Legal rights are those which permit a capacity to reside in one man to control «with the assistance of the State, the action of others.» They are the rights which can be enforced in a civil action. A universally accepted judicial decision says: «The very idea of legal right is, that it is one which is enforced and protected by the law, and as this can only be done by the remedy, the coercive means, whatever they may be, which the law affords for that purpose, it is plain that no one can have a legal right in that which another may take and apply to his use, and for doing so the law will find no redress.» The term «remedy,» in its comprehensive meaning, is the «means employed to enforce a right or redress an injury, including not only application to court, but any other lawful mode of obtaining satisfaction.» A legal proverb runs «no wrong without a remedy.» This assertion has been long held by jurists as nonimpugnable, and the claim remains that «where the law recognizes a right it gives a remedy to enforce it or redress its violation.» By extension the courts hold that «right and remedy are reciprocal.» And whether by common law or by statute such a right obtains it makes no difference. A distinguished authority says: «When there is an invasion of primary rights, then and not till then, the adjective or remedial law becomes operative and under it arise rights of action.» The legal right to an action at law does not exist until there has been a wrong, a violation of a legal right.

**RIGHTS OF MAN, Declaration of the,** a famous statement of the constitution and principles of civil society and government adopted by the French National Assembly in August 1789. It suggested the title for Paine's defense of the French Revolution against Burke (1791–92); which was followed by Mary Wollstonecraft Godwin's 'Vindication of the Rights of Women' (1798). In 1832 the Society of the Rights of Man was founded in Paris. Consult Abbot, L., 'Rights of Man' (Boston 1901); and for the text of the French declaration, Robinson, J. H., 'Readings in European History' (2 vols., New York 1903).

**RIGI,** rē′gĭ, or **RIGHI,** Switzerland, in the canton of Schwyz, an isolated mountain rising precipitously between Lakes Zug and Lucerne to a height of 5,905 feet. It may be ascended by two railways of special type and affords fine views on which account it is much visited by travelers who visit Rigi in large numbers.

**RIGOR MORTIS,** the rigidity of the body which comes on after death. It varies in the time of its appearance and also of its duration, sometimes setting in within a few minutes, at other times not for many hours and lasting in some cases but a very brief period, in others for several days. It is believed to be due to the coagulation of fluid substance in the muscular system which occurs after the withdrawal of nutrition from the tissues. Decomposition begins when relaxation of the body follows the passing of the rigor.

**RIIS,** rēs, **Jacob Augustus,** American journalist, author and social reformer: b. Ribe, Denmark, 3 May 1849; d. 26 May 1914. He came to the United States in 1869 and worked at different trades, until he became a reporter on the New York *Sun*. In this work he gained a thorough knowledge of the conditions in the slums of the city, and by his lectures and writings aroused interest in reforms in the tenement-house district and became a leader in the reform movement. When Theodore Roosevelt was police commissioner, Riis' thorough knowledge of the city was of the greatest aid to him and the commissioner was usually accompanied on his all-night tours of investigation by Riis. Under the leadership of the latter, police station lodging-houses were abolished, small parks in crowded districts opened, playgrounds equipped and many tenement-house evils done away with.

He, however, held but one official position in connection with this reform work, that of secretary of the New York Small Parks Commission in 1897. His first book was 'How the Other Half Lives,' published in 1890; other writings are 'The Children of the Poor' (1892); 'Nibsy's Christmas' (1893); 'Out of Mulberry Street' (1898); 'A Ten Years' War' (1900); 'The Making of an American,' an autobiography (1901); 'Battle with the Slums' (1902); 'Peril and Preservation of the Home' (1903); 'Theodore Roosevelt, the Citizen' (1904); 'The Old Town' (1909); 'Hero Tales of the Far North' (1910); 'Neighbors: Life Stories of the Other Half' (1914).

**RIKER,** rī'kėr, **Andrew L.,** American automobile engineer and designer: b. New York, 22 Oct. 1868. He was graduated at the Columbia Law School, but early turned his attention to automobile construction. He built one of the first electrically propelled vehicles in the United States; produced the first toothed armature; and has designed numerous automobile parts, as well as dynamos, motors, transformers and electric systems. He was also a pioneer in building electric trucks. He was awarded a medal from the French government for an automobile design in 1900; and in 1912 he became vice-president of the Locomobile Company of America. One of the first presidents of the American Society of Automobile Engineers, he was in 1915 appointed to the Naval Advisory Board as a representative of that society.

**RIKKI TIKKI TAC.** In spite of solid qualities, the popularity of 'Rikki Tikki Tac,' like that of many of the stories of Henri Conscience, is due in part to adventitious elements; for considered purely as a work of art it must stand on a lower plane than many another brief romance of its type. In construction of plot and the handling of incident its author here fails to show that deftness and sureness of touch which characterize the work of other masters, like Merimée or Turgenieff or Stevenson. Its appeal, as so often in the case of Conscience's work, is to sentiment. A life of hardship and suffering patiently borne and a love which triumphs through adversity provide a characteristic theme of life in Flanders in the days of Napoleon and after, and through it all, like sad, remembered music, runs the long, inexplicable, haunting refrain of the blacksmith's song. This with the description of the acrid smell of fires of sod, the shrilling of the cricket, the monotonous wide stretch of plain about Antwerp and the sense of tenderness, homesickness and loneliness, testify to the patriotic interest and homely, simple faith of its author.

CHRISTIAN GAUSS.

**RILEY,** rī'lĭ, **Charles Valentine,** American entomologist: b. London, England, 18 Sept. 1843; d. Washington, D. C., 14 Sept. 1895. He was educated at Dieppe and at Bonn, and in 1860 came to the United States where he spent three years in studying practical agriculture. He then engaged in newspaper work and in 1864 went to the front in the Union army. In 1868 he was appointed State entomologist of Missouri and in that year assisted in founding the *American Entomologist.* He was president of the Academy of Science at Saint Louis in 1876–77, chief of the United States entomological expedition to investigate the locust plague in 1877, and in 1878 became United States entomologist in the Department of Agriculture, an office which he occupied until 1894 with the exception of 1879–80 when conducting the cotton-worm investigation. In 1884 he was appointed curator of the National Museum and also became general secretary of the American Association for the Advancement of Science. He invented the «cyclone» or eddy chamber in nozzles for spraying purposes and made numerous discoveries of methods to control insect pests. His publications include 'Annual Reports on the Insects of Missouri' (9 vols., 1868–77); 'Annual Reports as Entomologist of the Department of Agriculture'; 'Potato Pests' (1876); 'Locust Plague in the United States' (1877); 'The San José Scale' (1895), etc.

**RILEY, (Isaac) Woodbridge,** American scholar: b. New York, 20 May 1869. He was graduated at Yale in 1892, and took the degrees of A.M. and Ph.D. there in 1898 and 1902 respectively. He was Johnston research scholar at Johns Hopkins University in 1904–07, and in 1908 became professor of philosophy at Vassar College. Since 1903 he has been associate editor of the *Psychological Bulletin.* Author of 'The Founder of Mormonism' (1892); 'American Philosophy' (1907); 'American Thought' (1915).

**RILEY, James Whitcomb,** American poet: b. Greenfield, Ind., 7 Oct. 1853; d. Indianapolis, Ind., 22 July 1916. Being one of those who never grow old, Mr. Riley was particularly sensitive on matters pertaining to his age, and the year of his birth is uncertain, some supposing that he was born as early as 1848. He was the son of Reuben A. Riley, a lawyer and politician, of Greenfield, Ind., and was educated to follow in his father's footsteps. The young man, however, didn't fancy law, and after a little elementary schooling he left home and became an itinerant sign painter. For 10 years he roamed the Ohio Valley, painting commercial signs on fences and farm outhouses. His clever sketches attracted wide attention and won praise from his employers. He led this free and easy existence, as happy and carefree as one could imagine, until the late seventies, when he obtained employment on a newspaper at Anderson, Ind. He then began to write verses, but received little encouragement. Then, in 1877, for the purpose of proving that his verses under a famous name would receive recognition, he perpetrated the famous «Poe Hoax.» By arrangement with J. Oscar Henderson, publisher of the *Dispatch* of Kokomo, Ind., Mr. Riley wrote and Mr. Henderson printed a poem in the style of Edgar Allan Poe, to which he gave the characteristic title of 'Leonanie,' and it was offered to the public as a hitherto unpublished product of the genius of Poe. This poem, it was stated, had been found written on the fly-leaf of a copy of Ainsworth's 'Dictionary.' A traveler had discovered the treasure in the sitting-room of an old inn near Richmond, Va., and had taken it away with him. The publication of the poem and the accompanying story excited interest throughout the country, and Mr. Henderson was called upon to produce the book in which it was written.

In some quarters the poem was accepted as genuine; in others it was denounced as a fraud and its alleged discoverers as imposters. To Riley's delight it proved that he was a real poet; but the storm of protest that the ultimate disclosure aroused made him think he had ruined his future with the public. He shouldered the burden and returned to sign-painting. For a time he traveled as a sort of minstrel with a patent-medicine vendor and played the violin to attract crowds to be solicited to buy nostrums. In the midst of these dismal days came a letter from the Indianapolis *Journal* inviting Riley to contribute and promising him real money for his verse. In the early eighties, therefore, he settled in Indianapolis and began writing verses in the “Hoosier” dialect for the *Journal;* publishing ‹The Old Swimmin'-Hole› and ‹When the Frost is on the Punkin,› and other poems under the pseudonyn of Benj. F. Johnson of Boone, which justly won him a great reputation in the West. He sent some of his poems to Henry Wadsworth Longfellow and received warm praise. In 1887 he participated in the Copyright Readings in New York City where he received the distinction of being invited, after his first appearance, to reappear on the second program, on which occasion James Russell Lowell gave him a high tribute. After this all the magazines clamored for his verse, and he began to sell his poems by volumes. Publication of books of poems year after year brought Mr. Riley wealth and wide recognition of his literary genius, and not alone in the genre form. Many of his poems are of imaginative fantasy or are gently philosophic. In 1902 he received the degree of master of arts from Yale University and in 1904 the University of Pennsylvania conferred upon him the degree of doctor of letters. In July 1911 the poet presented to the city of Indianapolis property valued at $75,000 for a site for a public library and school administration building. Mr. Riley had collected ‹The Old Swimmin'-Hole and 'Leven More Poems› into a little paper-backed book sold over the newspaper counter in 1883. In 1885 he published an unpretentious volume called ‹The Boss Girl and Other Sketches› (now called ‹Sketches in Prose›). In 1887 he brought out ‹Afterwhiles,› followed by ‹Pipes O'Pan at Zekesbury› (1888); ‹Nye and Riley's Railway Guide› (1888); ‹Old-Fashioned Roses› (1888); ‹Rhymes of Childhood› (1890); ‹The Flying Islands of the Night› (1891); ‹Green Fields and Running Brooks› (1892); ‹Pomes Here at Home› (1893); ‹Armazindy› (1894); ‹A Child World› (1896); ‹Rubaiyat of Doc. Sifers› (1897); ‹Riley Child-Rhymes› (1898); ‹Riley Love-Lyrics› (1899); ‹Home Folks› (1900); ‹Riley Farm-Rhymes› (1901); ‹The Book of Joyous Children› (1902); ‹An Old Sweetheart of Mine› (1902); ‹His Pa's Romance› (1903); ‹A Defective Santa Claus› (1904); ‹Out to Old Aunt Mary's› (1904); ‹Riley Songs o' Cheer› (1905); ‹While the Heart Beats Young› (1906); ‹The Boys of the Old Glee Club› (1907); ‹Morning› (1907); ‹Home Again With Me› (1908); ‹Old School Day Romances› (1909); ‹The Girl I Loved› (1910); ‹The Lockerbie Book› (1911); ‹Old Times› (1915). In 1902 ‹That Old Sweetheart of Mine› was published individually in a volume illustrated by Christy. Since that date many special editions of Riley's works have been printed until the total numbers 70. The ‹Biographical Edition› of his complete works was published in 1913. In 1910 Riley experienced an illness that brought him very near death. In the next year his birthday was celebrated in the schools of Indiana and of New York City. In 1912 the celebration became more wide-spread, and Greenfield, his birthplace, gave him a “Riley Day.” In 1913 the school children of Indianapolis paraded past his home on Lockerbie street, and “Riley Days” were held at Anderson, Indiana University and Cincinnati, Ohio, which places he visited. In 1914 the celebration was continued, and in 1915 Governor Ralston of Indiana issued a proclamation making Riley's birthday a day of celebration throughout Indiana. On the afternoon of his birthday a musical festival was given to him at which his poems were sung and danced and acted out in pantomime, and in the evening a banquet was given in his honor, which was attended by representatives from all sections of the country. James Whitcomb Riley is known as “The Hoosier Poet” and is often referred to as “The Burns of America.” A poet of the people — his own people — was Whitcomb Riley. Born among them when the Middle West was a big pasture, he lived and died among them when it had grown to be an industrial empire. Dreaming their dreams, singing their songs, sharing their joys, sorrows and fancies, he touched these things with the wand of his great genius and enshrined them in the heart of the nation. Mr. Riley was to American poetry what Mark Twain was to American prose. One measure of his success — and by no means the greatest — may be gauged by the fact that he was one of the few Americans who, having devoted their lives to poetry, was able to gain a fortune from it. Not only in America, but in all the world have children claimed James Whitcomb Riley as their own. All the sorrows, the happiness, the joy of existence have been expressed in his pages, and countless thousands have laughed and cried over them. He is the most widely read and best beloved of the singers of America. His verse occupies an unique niche in American literature. Mr. Riley never married, but he was a lover of children, whose spirit he divined so intimately, and of family life.

**RILEY, John,** English painter: b. Bishopsgate, London, 1646; d. there, 1691. He did not rise into notice until the death of Sir Peter Lely, but remained unsurpassed until the appearance of Sir Joshua Reynolds. He was an imitator of Van Dyck, and in both drawing and coloring must be reckoned one of the best portrait painters of his time. He painted the portrait of Charles II, who rather disconcerted the artist by exclaiming: “Is this like me? Then, odd's fish, I am an ugly fellow.” He also painted James II and his queen, William and Mary, Bishop Burnet, Dr. Busby of Westminster and Lord Keeper North.

**RILL MARKS,** little channels cut by running water on mud surfaces. They may become buried and be preserved on rock layers. They would be found only in terrestrial sediments.

**RIMBAUD,** răṅ'bō, **Jean Arthur,** French poet and author: b. Charleville, in the Ardennes, 20 Oct. 1854; d. Marseilles, 10 Nov. 1891. He early displayed unusual intellectual gifts and an erratic temperament. Some of his verses written at the age of 15 are included in the collections of his works, and before he was 17 he had run away from home three times, once being returned as a vagabond and twice because of want. At 17 he sent the poem ‹Le Bateau Vivre› to Verlaine at Paris and was warmly invited to visit that poet, who hailed him as a genius — recognition that is still vouchsafed him as the pioneer of the «decadent» movement in France. He remained in Paris until 1872, dividing his time as the guest of Verlaine and of Théodore De Banville, served in the army of the Commune, and afterward left Paris with Verlaine. They traveled in England and Belgium for 13 months and then separated after violent quarrels in which Verlaine twice attempted to kill the younger man. Rimbaud's ‹Une Saison en Enfer› (1873) detailed this extraordinary friendship. It was written in prose and was the only work he ever published. He then abandoned writing verse, although but 19, wandered through Germany and Italy and in 1875 disappeared. He eventually settled at Harrar, Abyssinia, and became a trader in coffee, perfumes, gold and ivory. He amassed a great fortune, became a sort of chieftain among the natives and was engaged in intrigues with Menelek and the French government against Italy. He was forced to go to Europe in 1891 for a surgical operation upon his knee and he died in a hospital at Marseilles. Meantime, his friends supposing him dead, Verlaine had published his poems ‹Les Illuminations› (1886), including the famous sonnet attributing colors to the vowels, and these have had a great influence over younger French poets. A collection of his works, with a biography, was published by his brother-in-law, Paterne Bevrichoy, in 1879–98. Consult also ‹Lettres de Jean Arthur Rimbaud, Égypte, Arabie, Éthiopie› (1899); Moore, G., ‹Impressions and Opinions› (1891).

**RIMINI,** rē'mē-nē (ancient Ariminum), Italy, city on the Adriatic, in the province of Forli, celebrated for its mineral springs, the sea-bathing of the adjacent Porta Marina and for the massive and elegant architecture of its chief buildings. Its fisheries are extensive. It was the seat of the celebrated Malatesta family. Pop. 50,000.

**RIMMER, William,** American artist: b. Liverpool, England, 20 Feb. 1816; d. South Milford, Mass., 20 Aug. 1879. He was taken to Nova Scotia by his parents in 1818 and in 1826 they removed to Boston. He studied medicine, paying his way by painting, and was a practising physician for 16 years. While he had given some attention to painting and sculpture it was not until 1860 that he achieved a really important work, the colossal head of ‹Saint Stephen› carved from granite (Boston Athenæum). In 1861 he finished his ‹Falling Gladiator› (Boston Museum of Fine Arts), a work which established his reputation for vigorous, powerful work and showed an accurate knowledge of the human figure. He then opened an art school in Boston and lectured at Lowell Institute and Harvard on art anatomy. He also lectured at Cooper Institute and the National Academy, New York. It was as a teacher that he attained his greatest success. Much of his work was executed in clay by chiseling instead of modeling, and was impermanent. The permanent works he left are regarded as anatomically almost perfect and possessed of much of the vigor and simplicity of the early Greek sculptors. Besides the two already mentioned his remaining works are ‹The Fighting Lions› (Boston Art Club); ‹A Dying Centaur› (Boston Museum of Fine Arts), and a statue of Alexander Hamilton (Boston). He was author of ‹Elements of Design› (1872); ‹Art Anatomy› (1877).

**RIMMON.** See Rammon.

**RIMOUSKI,** rē-moos-kē', Canada, town in the county of Rimouski in the province of Quebec, on the right bank of the Saint Lawrence River, and on the Intercolonial Railroad, 185 miles northeast of the city of Quebec. The principal occupations are lumbering and fishing; trout and salmon are abundant. It is a favorite summer resort on account of its cool climate and the opportunities for hunting and fishing. Communications by water are cut off about half the year, when the river is frozen. Pop. about 3,100.

**RIMSKI-KORSAKOV,** rĭm'skē-kôr'sä'kŏf, **Nicholas Andreyevitch,** Russian composer: b. Vihkvin, Novgorod, 18 March 1844; d. Petrograd, 20 June 1908. He was graduated at the Naval Academy at Petrograd in 1862, served as a midshipman in the Russian navy and made a cruise around the world, and by 1865 had produced a symphony in E minor which was the first written by a Russian composer and was performed under the direction of Balakirev. He was retired from active service in the navy in 1873 and was appointed a professor at the Petrograd Conservatoire. He became associated with a group of younger Russian composers, Borodin, Cui and Moussorsky, disciples of Balakirev, and devoted to the cause of individual national music. He was most famous outside of Russia for his symphonies, but he also wrote 13 operas, several orchestral suites and overtures and many songs and pianoforte pieces. He succeeded Balakirev as the leading conductor in Petrograd. His work was individual and placed him among the foremost Russian masters. He often introduced Russian folk-melody themes into his compositions, working out the combinations with extraordinary smoothness and richness and avoiding violent methods. Besides the miscellaneous work and symphony already mentioned he wrote two other symphonies (Op. 9 and Op. 32); and the operas ‹Pskovitianka› (1873); ‹The Snow Maiden› (1880); ‹Mlada› (1892); ‹Mozart and Salieri› (1898); ‹Servilia› (1902); ‹Kites› (1905), etc.

**RIMU,** or **RED PINE,** a New Zealand tree (*Dacrydium cupressinum*) of the yew family. It grows to a height of 40 to 80 feet, and from two to six feet in diameter. The branches are pendulous and feathery, and the leaves slender and needle-like. Its brown wood is valued for general building purposes. The young branches make good spruce beer.

**RINDERPEST,** a general term covering various malignant diseases of neat cattle. Rinderpest proper is an acute infectious disease of cattle and sometimes of other ruminants, characterized by high fever, rapid pulse and cessation of milk-production during the first few days of the attack, followed by congestion and subsequently ulceration of the visible mucous membranes. The mortality is often as high as 90 per cent. This disease has been on record since the 4th century. It was first known in eastern Russia and central Asia, whence it has periodically emerged, causing havoc among cattle and heavy losses to the various European nations. From Europe it spread to Egypt. It appeared in Somaliland in 1889 and spread southward, reaching the Zambesi in 1896. It caused great loss to South African farmers and led to troubles with the natives whose cattle were affected. Inoculation with a prepared virus has given encouraging results as a means of securing immunity. The stamping out process is the only way to combat the disease.

**Pleuro-Pneumonia.**— This «lung-fever» is a contagious malignant disease of cattle attended by inflammation of and exudation on the pleura and in the lungs. A disease, somewhat similar, has recently attacked goats. This disease has been recognized since the close of the 18th century. At present it occurs in Europe, Asia, Africa and Australia, but is under control in Great Britain. It was introduced into the United States in 1843, and outbreaks were reported at intervals. By 1883 the disease was distributed throughout the Eastern States and as far west as Chicago and constituted a serious menace to the livestock interests of the country. No temporary measure can be used in dealing with this scourge. The only ones practicable are quarantine, restriction of movement of cattle, slaughter of affected animals and disinfection. The wisdom of such measures is vouched for by the results. Less than five years and the expenditure of only $1,500,000 by the Bureau of Animal Industry of the Department of Agriculture at Washington sufficed to place this disease under control. No case has been reported in the United States since 1892.

**Anthrax**, a specific infectious disease of mammals including man, also known as splenic fever, charbon, woolsorters' disease, etc., due to the presence in the blood of the micro-organism *Bacillus anthracis*. The diseased animal may suddenly fall to the ground as in apoplexy and die, or it may live 10 to 24 hours or more in a sub-acute case. The symptoms are high temperature, muscular trembling and labored breathing with prostration. The presence of the germ in the blood is proof of the disease. All carcases should be burned, as if buried the germs may remain in the soil or be carried in the soil water. Cattle may be immunized by inoculating with attenuated virus, with toxins or antitoxin serums. Anthrax vaccine is on sale.

Blackleg, or quarter-ill, etc., called also symptomatic anthrax, usually attacks young cattle. It is due to a bacillus. Immunity to this disease is conferred by vaccination with black-leg vaccine.

**Texas, Southern, or Spanish Fever,** is a contagious disease of cattle caused by a parasitic protozoan (*Pyrosoma bigeminum*), and is carried from Southern cattle to Northern cattle by the Southern cattle-tick (*Boophilus bovis*). Adult ticks fall from the cattle, lay eggs and thus infest the soil with young ticks that carry the germs. Northern cattle passing over the ground get the ticks and subsequently the fever. When the ticks become attached to the skin they inoculate the cattle with the parasites, which in unimmune animals rapidly multiply, destroy the red corpuscles of the blood, causing high fever and a temperature of 106° F. or more, general weakness and finally death. In the later stages the urine is highly colored, showing the great loss of red blood cells, hence the name «red-water» for the disease. These symptoms and the presence of the ticks enable the disease to be recognized. Post-mortem examination reveals an enlarged spleen, containing a dark tarry substance instead of normal pulp. The ticks can be destroyed by dipping the cattle in a light lubricating oil containing dissolved sulphur. In the South cattle may be kept free from the fever by keeping them free from ticks in an uninfected enclosure. Young calves may be rendered immune by keeping ticks on them, and a considerable degree of immunity can be conferred on animals by inoculating them with the blood of Southern cattle, thus producing the fever. This disease has been widely disseminated throughout the southern parts of the United States. Thanks to the Federal quarantine from Virginia to California, established in 1899, however, so as to control the movement of Southern cattle into Northern States, the disease is steadily being restricted to smaller and smaller areas and bids fair to be exterminated.

**Foot and Mouth Disease or Aphthous Fever,** a contagious eruptive fever attacking cloven-footed animals and communicable to many others, including man. Eruptions occur as blisters in the mouth, on the udder, teats and feet, with an elevation of temperature of from 2 to 6 degrees. Although in mild attacks only 2 to 3 per cent of the animals attacked succumb, it depreciates the value of the survivors from 20 to 50 per cent. When present in a malignant form, 5 to 50 per cent of the adults die and 50 to 80 per cent of the calves. It is more to be feared than pleuro-pneumonia. The milk from diseased cows may transmit the disease to those partaking of it, and the disease produced in this manner is, especially when it attacks children, serious and sometimes fatal. The disease was first seen and recognized in England in 1839 where it continued with more or less prevalence until 1886, since when it has appeared less frequently. In 1870 it was introduced into the United States from Canada. The introduction of the disease into New England in 1902 drew attention to the dangers of the malady. Since then sporadic attacks have occurred in several States. Isolation and quarantining of diseased animals is futile; slaughter of diseased animals and prohibition of movement of stock in the infected areas have proved the most efficacious methods of eradicating the disease.

**Tuberculosis** is one of the most insidious diseases infecting cattle and other animals. Like human tuberculosis, it is due to a germ, the tubercle bacillus which may affect any part of the body where it can secure a lodgment. Recent investigations show that the same bacillus may cause human and bovine tuberculosis, hence there is need to guard against human infection with bovine tuberculosis, and particularly to guard children from tuberculous milk. Plenty of good food, fresh air and sunlight, rigid cleanliness, the use of disinfectants and the determination and isolation of affected animals are now viewed as the best means of checking the disease. The tuberculin test is a ready means of determining whether or not cattle are tuberculous. Tuberculin is made by growing the bacterium for two or three weeks in bouillon to which glycerine is added. The germs are then killed by heating and their remains removed by filtration. Carbolic acid is added to prevent decomposition and the fluid is packed in sealed sterilized bottles. Inoculation with this fluid causes a rise in temperature in the case of diseased animals. See CATTLE, DISEASES OF.

**Bibliography.**— Consult various Reports of Bureau of Animal Industry, Washington, D. C.; also of the State departments of agriculture in many States; and bulletins of the State agricultural experiment stations.

**RINEHART,** rīn'härt, **Mary Roberts,** American novelist: b. Pittsburgh, Pa., 1876. She was educated at the Pittsburgh High School and the Pittsburgh Training School for Nurses, and in 1896 was married to Stanley Marshall Rinehart, M.D., of Pittsburgh. She attained her first literary success through her clever mystery stories and she later became well known as a novelist and playwright. She made a tour of the western battle front under the protection of the allied governments in 1915, and after the entry of the United States into the European War volunteered as a nurse. Author of 'The Circular Staircase' (1908); 'Window at the White Cat' (1910); 'Amazing Adventures of Letitia Carberry' (1911); 'Street of Seven Stars' (1914); 'Kings, Queens and Pawns' (1915); 'Altar of Freedom' (1917); 'The Amazing Interlude' (1918); 'Dangerous Days' (1919), etc.

**RINEHART, William Henry,** American sculptor: b. Carroll County, Md., 13 Sept. 1825; d. Rome, Italy, 28 Oct. 1874. He apprenticed himself at 21 to a marble-worker of Baltimore, and 10 years later went to Italy where he remained two years. On his return to Baltimore he executed several busts and a fountain for the United States general post office. He did not stay long in the United States, though his success as a sculptor met with much appreciation here, but established himself in Rome in 1858. Among his best-known works are the reliefs 'Night' and 'Morning'; his highly poetic and well-wrought 'Clytie' and 'Love Reconciles with Death'; 'Latona and her Children'; 'Antigone'; 'Atlanta' and 'Endymion.' He finished the bronze doors for the national Capitol, a work bequeathed to him by Crawford.

**RINES, George Edwin,** American editor: b. Maitland, Hants County, Nova Scotia, Canada, 28 Dec. 1860. Coming to the United States when 11 years old, his early education was obtained in the public schools of Brooklyn, N. Y. For several years after graduation from the high school there he was engaged in mercantile life, but in 1887 resumed his studies at Colgate University, Hamilton, N. Y. In 1890 he entered the full Hebrew and Greek course in theology and was graduated from the Hamilton Theological Seminary in 1893. He was for two years pastor at Binghamton, N. Y., afterward accepting a call to the pastorate of the First Baptist Church of Ridgewood, N. J., where he remained for three years. He resigned from the ministry in 1899 to devote himself to literary work, and has been a frequent contributor to religious and other periodicals. In 1903 he was appointed managing editor of the 'Encyclopedia Americana,' to which he contributed many articles. Subsequently Mr. Rines was managing editor of the 'United Editors' Encyclopedia,' and in 1910–11 was general editor of 'The Foundation Library for Young People.' In 1913–15 Mr. Rines was managing editor of 'The German Classics,' and after 1916 was editor-in-chief of the 'Encyclopedia Americana' (2d ed.). This second edition he planned with consummate care, adding many features hitherto foreign to works of reference. His particular care was to have an adequate treatment of every phase of American life and American government and informative articles describing the motives and actions of America in the Great War and the mighty forces loosed by her participation in that conflict.

**RING.** See RINGS.

**RING-BONE,** a bony excrescence on the pastern of a horse. It is a morbid growth, callus or exostosis, commonly due to inflammation, and in some cases extending to toe-joints with disabling effect. It is one of the more frequent ailments of horses and, although ordinarily affecting animals of inferior condition or injured by overwork, it sometimes appears in very young colts. While not always visibly impairing the serviceableness of a horse, ring-bone usually depreciates the market value of animals affected with it, and as cure is practically impossible it is a defect which calls for particular preventive methods in the care and breeding of horses and for cautious scrutiny in the purchase of them.

**RING AND THE BOOK, The.** This is indisputably one of the most remarkable poems of the 19th century. In 21,000 lines of blank verse — such poems as the 'Iliad' and 'Paradise Lost' with their breadth of theme fall far short of this total — Browning unfolds a story centring in a murder actually committed at Rome in 1698. A Tuscan nobleman, nearly 50 years old, slew his young and low-born wife, whom he had wedded for her fortune. The material Browning derived from a miscellaneous collection of documents, legal and other, relating to the trial, partly in print, partly manuscript, bound together in a volume — the so-called 'Yellow Book'— which fell into his hands, probably in 1860. The details, thoroughly assimilated by the poet's imagination, are used in the poem with marvelous fidelity and fullness. The poem already begun in 1862, was published in 1868, and was the first work of its author to receive adequate recognition in the reviews.

The plan is unprecedented and seemingly cumbrous. Owing to Browning's employment of his favorite monologue form, the story is told 11 times. In the monologues we become acquainted with events and actors as transmitted through the personality of each speaker and colored by his prejudices. The interest is maintained, in these repetitions, by extraordinary subtlety, psychological insight and imaginative grasp. The central figure, a triumph of creative imagination, is the girl-wife, Pompilia. The central interest is her relations with the noble young churchman, Caponsacchi, who rescues her from the tyranny of her husband. Here we have a spiritual romance — love in that purely altruistic form in which it so often appears in Browning's pages as the motive force of the highest life.

In Book I the poet, speaking in person, tells of the finding of the ‹Yellow Book›; outlines the story — thus eliminating the element of plot interest; and explains the circumstances in which each of the following monologues is spoken. In Books II–IV, we see the case as it appears to the general public. Two ordinary citizens in gossiping fashion narrate the story, — the first with a bias toward the husband, the second toward the wife. In Book IV, an habitué of the higher circles complacently unfolds, for a politer audience, a more subtle and cynical view. The reader, familiarized with the facts through these partially informed and conflicting statements, is next introduced into the very heart of the action. In Book V Count Guido, the husband, unable to deny the deed, and in peril of his life, sets forth before the judges a cunning and plausible justification; in Book VI, Canon Caponsacchi gives an impassioned narrative of his relations with Pompilia; in Book VII Pompilia, on her deathbed, with infinite pathos, tells her story. The next three monologues — uttered by officials — are on a lower plane. Books VIII, IX contain the pleas of the lawyers, indifferent to the truth, and intent only on displaying their skill in legal quibbling: these books are humorous and satirical, and Browning's penchant for special pleading finds full scope. Book X consists of the meditations of the Pope as in the privacy of his chamber he writes his confirmation of the sentence and orders the execution. The figure of the Pope is a noble and impressive one, and in his discursive meditations he utters much of Browning's favorite philosophy. In Book XI Guido «the same man, another voice, speaks and despairs this last night of his life.» Finally the poet himself, in Book XII, by means of extracts from imaginary letters, ties up the loose threads of his tale and concludes with reflections on art.

The style offers few of the difficulties which are supposed to confront the reader of Browning, and the books may be enjoyed separately. As is natural in the case of a work so recent and novel, critical estimates vary. It was a favorite poem with George Meredith, while Carlyle threw off the remark that «it was among the absurdest books ever written by a gifted man.» Arthur Symons writes that «it takes rank easily among the greatest poems.» William Sharp considers it, regarded as an artistic whole, «the most magnificent failure in literature.» The faults alleged are in the direction of excess. «No one has said that it is too short,» remarks Dowden, «many that it is too long.» Professor Hereford speaks of its «immense, even riotous vitality,» of its being «even mercilessly voluble, but with the volubility of a consummate master of expression, in whose hands the difficult medium of blank verse becomes an instrument of Shakespearean flexibility and compass, easily answering to all the shifts and windings of a prodigal invention.» It is doubtful if any competent critic would now deny that the book is the product of imaginative and intellectual power almost unparalleled — the latter at times unfortunately predominating. Most competent readers will probably assent to Symon's dictum «It has a wealth of spiritual insight, human science, dramatic and intellectual and moral force, a strength and grip, a subtlety, a range and variety of genius and knowledge without parallel save in the pages of Shakespeare.»

**References.**— Mrs. Orr's Handbook; John Morley in *Fortnightly Review*, 1869; James Thomson in *Gentleman's Magazine*, 1881; the ‹Yellow Book› is published in facsimile, with English translation and notes by C. W. Hodell, Carnegie Institution, Washington; the translation is republished in *Everyman's Library*.

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**RING-DOVE, or CUSHAT.** See DOVE; PIGEON.

**RING-MONEY,** *in numismatics,* an ancient metallic currency in the form of rings. This seems to have originated with the Egyptians, with whom rings were freely used as ornaments, and the same rings appear to have answered both purposes. The use of ring-money in Africa subsists to this day. A form of ring-money was also anciently used in Ceylon.

**RING-OUZEL,** oo'zl, a European thrush (*Turdus torquatus*), rather larger than a black bird and of shy habits, preferring mountain slopes, heaths and wild land to cultivated districts, but it often makes raids on fruit gardens, and in vine countries feeds largely on grapes. In some parts of Scotland it is known as the moor blackbird. The song consists of a few loud, clear and plaintive notes, and is somewhat monotonous. It is dark-brown with grayish wings and has a broad crescentic white gorget, whence the name. See OUZEL.

**RING PLOVER, or RINGNECK,** a common plover or dotterel (q.v.) of the whole northern hemisphere (*Ægialitis hiaticula*), distinguished by its black collar and its brilliant, gold-colored eyes. This bird was formerly celebrated in European folk-medicine. To be cured of the jaundice it was held to be only necessary to look fixedly at the bird's eyes with a firm faith in the success of the experiment. See PLOVER.

**RING SNAKE,** the name of various serpents with a band encircling the body, especially at the neck. In the United States the name belongs especially to a small harmless serpent of the warmer States (*Diadophis punctatus*), which is found «coiled up under stones, logs or the bark of fallen trees, chiefly in forests.» It is bluish black above, yellowish orange beneath and has a whitish collar. In Great Britain the common grass-snake (q.v.) is often so called; in South America, the many-banded coral-snakes and in South Africa a large black and yellowish venomous hooded snake (*Sepedon hæmachates*) known to the Dutch as «ringhals,» and differing from the cobras only in anatomical peculiarities. Consult Gadow, ‹Amphibia and Reptiles› (1901).

**RING-TAILED LEMUR.** See LEMUR.

**RINGGOLD GAP, Battle of.** After the expulsion of the Confederates from Missionary Ridge 25 Nov. 1863 they retreated on Dalton (see CHATTANOOGA, BATTLE OF). To intercept the retreat, General Thomas, on the morning of the 26th, ordered General Hooker to push on Graysville, from near Rossville, and directed General Palmer, commanding 14th corps, to report to Hooker and join in the movement. On reaching Pea Vine Creek Palmer was ordered to move directly on Graysville, while Hooker, with his three divisions — Osterhaus', Geary's and Cruft's — moved on Ringgold to strike the Confederate line of retreat six miles farther south. At 9 P.M. Palmer struck the Confederate rearguard, capturing three guns and some prisoners. Pushing on to Graysville, which was reached at 11 P.M., he captured more prisoners and another gun, and bivouacked for the night. Hooker advanced to within six miles of Ringgold, and late in the night bivouacked a short distance to the right of Palmer. At daybreak of the 27th Hooker renewed the pursuit, Osterhaus' division, in the advance, capturing many prisoners, and pursuing the Confederates into Ringgold. At 3 A.M. of the 27th General Cleburne, whose division was acting as rear-guard to Hardie's corps, received an order from General Bragg to hold Ringgold Gap, in Taylor's Ridge, near the town, until the trains and rear of the retreating troops could get well advanced. Cleburne disposed his four brigades of about 4,200 men on the ridge, on each side of the gap, and as a support two guns in it, and in less than half an hour Hooker came up and Wood's brigade of Osterhaus' division was ordered to attack. Cleburne's skirmishers were soon driven in; but Cleburne, assuming the offensive, attacked Wood's main line and was repulsed, Wood's men following to the gap. Meanwhile Williamson's brigade had made a lodgment on a spur of Taylor's Ridge, half a mile to the left of the gap, but found the Confederates so strongly posted that it could make no headway, and Creighton's brigade of Geary's division was ordered to ascend the ridge still further to the left. Cleburne had anticipated the movement by still farther extending his right. Colonel Creighton, making a gallant assault, was badly repulsed, and in falling back he carried part of Williamson's brigade with him. While Creighton was preparing for another assault he was killed, and operations on that part of the field were suspended. Meanwhile sharp work was going on in the gap and on the line on either side of it, without any material advantage to Hooker. Between 12 and 1 o'clock Hooker's artillery came up and opened a furious fire upon Cleburne's position, but Cleburne had gone, leaving only a few skirmishers in the gap. These were closely followed by some of Geary's men to the bridges beyond the gap. General Grant arrived on the field early in the afternoon, and orderd pursuit discontinued; later in the day Grose's brigade went forward, but encountering cavalry, supported by infantry, it returned to Ringgold. The Union loss at Ringgold Gap was 65 killed and 377 wounded. The Confederate loss, as reported by Cleburne, was 20 killed, 190 wounded and 11 missing. Consult 'Official Records,' Vol. XXXII (Washington 1889–1901), and Van Horne, 'History of the Army of the Cumberland,' Vol. I (Cincinnati 1875).

E. A. CARMAN.

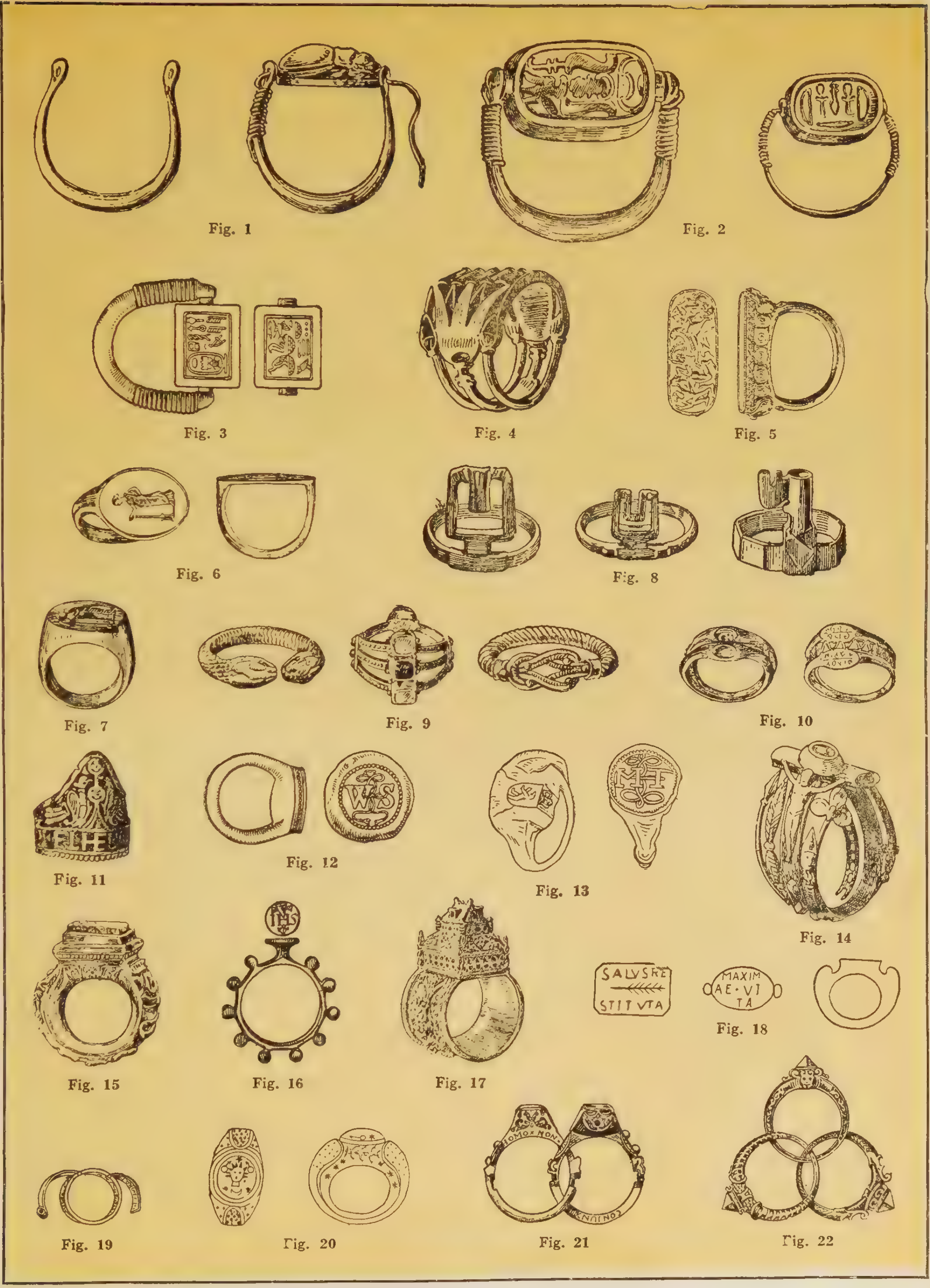
**RINGS.** Among primitive races ring adornment of the human members is universal and dates back to prehistoric times. Lip rings (*labrets*), neck rings (*torques*, etc.), nose rings, anklets, bracelets, ear rings were worn by the «savages» of the different countries. The Orientals, from time immemorial, have worn rings on their toes; married women wearing them on the big toe of the left foot, men wearing them on the big, second and third toes. The finger ring, strange to say, does not figure among the aboriginal adornments of the wild or savage tribes (America, Africa, etc.). The finger ring appears to have originated with the early Egyptians, and was evolved from the seal or signet (about 16 centuries before our era). The intaglio seal affording security and authenticity of ownership was probably carried strung on a cord until the invention of fastening it in a stirrup-shaped loop. A hole was bored longitudinally and wire passing through this entered holes in the extremities of the loop (see Figs. 1, 2) to be fastened by winding round the latter. Fine specimens of goldsmiths' work in this form are in the Louvre and London museums. The seal being sign of power or authority, it was natural that the wearer of the portable seal (a signet ring) assumed dignity. In this sense Pharaoh (Gen. xli, 42) invested Joseph with his ring; a ring in the Ashburnham collection, it is claimed, may be this very one (see Fig. 3) as it was found in a mummy case (in the Necropolis of Sakkarah, near Memphis) having hieroglyphics indicating that it contained the body of Joseph. The step from the ring being insignia of authority to its becoming an article of adornment is a short one, and we find the Egyptian ladies wore finger rings, even several on a single finger; a number of elegant specimens are extant (see Fig. 4). Herodotus (5th century B.C.) tells the story of the ring of Polycrates, tyrant of Samos. Warned that the great wealth and marvelous successes would bring dire visitations from his enemies in later life if he did not make some great sacrifice to the gods to forefend disaster, he threw his most valued possession, a talismanic ring, into the sea. His cook found it in the belly of a fish and returned it to him. The Greeks, Etruscans and Romans produced lovely finger-rings (see Figs. 5–7). One quite peculiar form of Roman ring has a key attached to it, some specimens have numerous wards and even the hollow *barrel* (see Fig. 8) of modern keys. Roman rings are in many decorative forms (see Fig. 9), the betrothal ring (*anulus pronubus*) being composed of two rings having oval plates containing the engraved names of the betrothed couple (see Fig. 10). Like the rings of the Spartans, the betrothal ring was made of iron, till Pliny's time. But we have Roman rings made in double, triple, even quintuple form; such were termed *polysephi*. Mythology records a ring dating back far beyond those above mentioned, for it informs us that, when Jupiter released Prometheus from his agonies on the Caucasian rock, he had to wear on his finger one of the links of his iron chain with a piece of the rock set in it as reminder of his terrible experience. The first Roman senators wore rings of iron, but when acting as ambassadors a gold one was given them; later they could all wear gold rings. Next the privilege of wearing a gold ring became so common even the menials wore them and only slaves wore iron rings. When Hannibal's soldiers took the gold rings from the Roman dead after the battle of Cannæ (216 B.C.) they filled, some writers say, three bushel baskets. During the Roman Empire it was a custom to give birthday (anniversary) rings, termed *anuli natalitii*. The imperial signet of Constantius (306 A.D.) is in the Rinucinnit cabinet at Florence with its 53-carat sapphire engraved with the scene of the emperor spearing a wild boar, etc. Of Anglo-Saxon rings the British Museum (London) contains that of King Ethelwulf (see Fig. 11) and that of Ethelswith, his daughter, queen of Mercia, of the 9th century. Other extant rings of historic interest are: The «Shakespeare ring» (see Fig. 12) supposed to have been given by Anne Hathaway to the poet, which was found in a field at Stratford-on-Avon; the ring said to have been given to Henry Darnley (her spouse) by Mary Queen of Scots (see Fig. 13); the wedding ring Martin Luther gave to Catherine Bora when he made her his wife (see Fig. 14), it is what is known as a «Passion» ring, carrying the symbols of the Passion. The wedding ring of the Romans was a signet ring and conveyed the meaning that it was the wife's right to seal up the property of the household; it, sometimes, had a small key attached. It was placed on the fourth finger in early Roman days; the index finger was regarded by the Jews as the hallowed finger and bore the marriage ring; in the days of «Queen Bess» of England the ring, after betrothal, was worn on the thumb. The betrothal ring in Britain became the wedding ring about the time of the Reformation.

**Ecclesiastical Rings.**— Closely allied to the wedding ring is the ecclesiastical ring, ceremonially wedding the wearer to the Church, as well as signifying the dignity of the office. Most important of these insignia jewels is the papal ring, called the «Fisherman's Ring» (or *anulus piscatoris*), with its gem stone containing an engraving (used by the Pope for his seal) of Saint Peter in a bark pulling up a fishing net and the Pope's name above. A new one is conferred by the cardinal-chamberlain, to be broken on the death of the Pontiff. *Episcopal* rings conferred on bishops and abbots are of gold embellished by a stone; the latter must not be cut (as is the papal ring) but left in its natural form (see Fig. 15), though polished. The stone was formerly green (emerald favored), later blue (sapphire), but Dr. Kunz says: «Besides rubies and emeralds, balas-rubies, turquoises, chalcedonies and even opals were used, pearls and garnets also appear occasionally.» The *episcopal* ceremonial ring is worn by the bishop outside his glove, and is, therefore, quite a large ring. An amethyst, emblematic of sincerity, innocence and earthly suffering is worn in the rings of cardinals and bishops as a sign of submission to the Church as well as of spiritual power. *Decade* rings came into being in the 14th century and are so termed from the fact that they have 10 projections on their circumference. They answer the purpose of a rosary (see Fig. 16) and each knob represents an *Ave*, while the head or bezel (often with I.H.S. and the three nails) represents the *Pater Noster*. Peculiar to England and Scotland are the so-called *iconographic* rings, with their Virgin Mary and Child, or saints' images, in gold or silver. They were made from 1390 to 1520. The Jewish ceremonial wedding ring is frequently a very large and cumbersome device with its bezel towering into the architecture of houses (see Fig. 17) and with raised filigree ornamental circlet. A very noted ceremonial ring is the English «Coronation» ring; it is of pure gold and large, being worn over the glove, generally on the index finger of the right hand formerly, except on celebrating Mass, when it is changed to the annular finger. Usually it has a large violet-hued table-cut ruby, and a Saint George's cross is engraved on the flat surface; 26 diamonds surround the ruby.

**Memorial Rings.**— In olden times it was the custom to bequeath *memorial* rings to one's friends, as is shown in many wills. Richard II (1400) left a gold ring to each of his nine executors. Shakespeare (1616) bequeathed rings to a number of friends. Samuel Pepys willed 123 memorial rings to surviving friends. Followers of Charles I, after his execution, wore memorial rings, some with his effigy or name on them, and it established a custom that lasted for many years. Black enamel or niello was favored for memorial rings, but in the 18th century young maidens' deaths were memorialized with rings in white enamel. Hair from the head of deceased, in the end of the 18th century, was used in forming a device in the bezel. Later very plain rings came into vogue with just a motto, as: «To the Memory of ........» Other mottos seen are: «Not lost but gone before,» «Memento Mori,» etc. But the «Memento Mori» rings so-called are those bearing a death's head. Extant are rings with the letters BDLK, they stand in memory of executed lords Balmerino, Derwentwater, Lovat and Kilmarnock.

**Occult Rings.**— The fact that, in mediæval days, certain peculiar-shaped pieces of stone, metal, ore, etc., were considered to have occult powers of great value led to the setting such talismans in finger-rings to obtain security and portability. Cabalistic words or sentences also served for occult influences and we find them on rings (see Figs. 18–20); astrological signs of significance are frequently found on such talismanic rings. Great curative power was supposed to be possessed by certain mystic rings carried by physicians of olden times, they are known as *medicinal* rings; Galen (about 200 A.D.) was renowned as a doctor and tells of a green jasper amulet of King Nechepsus, of Egypt, that had a design cut in it representing a dragon surrounded by rays. He said it was a most potent remedial agent for the digestive organs. To be numbered among the *medicinal* rings are the «royal cramp rings.» Edward the Confessor, king of England (1042–66) instituted the practice, according to the legend, from the fact that, he being without money, one day when an aged pilgrim accosted him, the royal personage handed over a ring as alms. The pilgrim turned out to be no other than the Apostle Saint John in disguise, who sent the ring

# RINGS



Figs. 1, 2 — Finger Rings Fig. 3 — Joseph's Ring Fig. 4 — Egyptian Lady's Ring Fig. 5 — Etruscan Ring Fig. 6 — Greek Rings Fig. 7 — Roman Ring Fig. 8 — Roman Key Rings Fig. 9 — Other Roman Rings Fig. 10 — Roman Betrothal Rings Fig. 11 — Ring of Ethelwolf Fig. 12 — Shakespeare's Ring Fig. 13 — Ring of Mary Stuart to Darnley Fig. 14 — Passion Ring of Martin Luther Fig. 15 — Ecclesiastical Ring in the Cluny Museum. (Note the Uncut Stone) Fig. 16 — 16th Century Ring Fig. 17 — Jewish Wedding Ring Fig. 18 — Physician's Medicinal Ring Fig. 19 — Cabalistic Ring in the Londes-Borough Collection Fig. 20 — Astrological Ring Fig. 21 — Gimmel Rings Fig. 22 — Triple Ring, Arms of Cosimo Di Medici

back to the king with the information that he had blessed the ring and it now had great curative power. Since which time, up to the reign of Queen Mary, the English kings and queens had *blessed* and distributed a number of rings on Good Friday which were said to be a sure cure for «falling sickness» (epilepsy) and were termed «cramp rings.» The antithesis of *medicinal* were *poison* rings. The Borgias are said to have used rings containing poison, which, by pressing the victim's hand, pricked and poisoned with deadly effect. Such rings dating from that period are in existence; the poison (liquid) was hidden in a small cavity in the bezel. In ancient times it appears to have been a frequent custom to wear a ring containing a deadly poison with which to escape from torture if taken prisoner. Hannibal took a fatal dose of poison from his ring when he was to be given over to his enemies, the Romans. «Posey rings» were a mediæval invention and contained inscribed love mottoes. The word is frequently spelled *posie* and *poesie;* originally they were called «chanisons» or «reasons.» The earlier specimens have the couplets engraved on the outside, but later (by the 16th century) they were hidden in the inside where only the wearers could see them. On them we find such expressions as: «Many are the starres I see, Yet in my eye no starre like thee,» «No love so hard as love debarred,» «My life is done when thou art gone.»

**La Semaine** rings of France came into vogue in the 19th century, and carried seven stones, the name of each commencing with the same letter as the day of the week.

**Gimmel** rings (spelled also *gimmal, gemmel, gemmow,* etc.) were old style matrimonial rings composed of twin loops (see Fig. 21) that linked into each other. While generally double we find them made in triplets, or even further complicated. Herrick writes: «Thou sent'st to me a true-love knot, but I return a ring of jimmels, to imply thy love had one knot, make mine a triple tie.» The device of the noted Cosimo di Medici consisted of three diamond rings entwined (see Fig. 22); they recall the fact that at an early date diamonds were set in rings, before the method of cutting them was discovered, with the natural conical point of the crystal extending from the bezel. These points were used by the ladies and gentry to cut love couplets and other inscriptions on glass windows, etc.

**Hololith** rings, Dr. Kunz tells us, are those made entirely of a single piece of stone. Perhaps the most costly of these is that emanating from the Mogul Empire (16th century) and made for Jehangir Shah. It is cut out of a single emerald «of exceptional purity and beauty of color.» More frequent are rings made solely of amber, rock-crystal, chalcedony, carnelian, jade, coral, steatite, ivory, etc.

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**RINGWORM,** a disease occurring in three varieties, in one of which it attacks the scalp, in another the beard and in the third some part of the body. In all cases it is due to the presence of a vegetable parasite, consisting of minute round bodies, and of thread-like structures formed of rows of rod-shaped bodies of a beaded appearance. This is the growing fungus (*Trichophyton tonsurans*) and its spores, and wherever ringworm occurs this is present between the layers of cells of the scarf-skin, in hairs and hair-sheaths. Ringworm of the body (*Tinea circinata*) is the name given to the disease when it occurs on non-hairy parts of the body. It is most common on the face, neck and trunk, but it also occurs on the hands, arms and wrists. It consists of small circular patches, rose-colored and slightly raised, covered with small branny scales. Usually round the margin is a ring of very small blisters. The spot is the seat of a tingling and itching sensation. It spreads around the margins, and as it spreads the centre heals up, so that a large red ring with a pale centre is formed. Ringworm of the scalp (*Tinea tonsurans*), identical with favus (*Tinea favosa*), begins with small red patches like those described above and spreads at the margins. It involves the hairs, which become penetrated by the fungus, and are dry, dull and twisted. They are easily pulled out and become very brittle. The affected patch becomes covered with a grayish-white powder. Inflammation may be produced and crusts formed. This variety of ringworm is commonest in children. Ringworm of the beard (*Tinea sycosis*) is similar to the scalp variety. A lotion of bichloride of mercury is often sufficient to kill the fungus, but if it prove ineffectual glacial acetic acid may be painted all round the spreading margins of the ring. In ringworm of the head and beard the hair of the diseased patches and for a little distance beyond should be cut short, and crusts should be removed by poulticing, washing with water and soft soap, etc. The general health should be maintained by the use of tonics and otherwise. Ringworm is very contagious.

**RINK, Hinrich Johannes,** Danish Arctic explorer: b. Copenhagen, 26 Aug. 1819; d. Christiania, Norway, 15 Dec. 1893. He took his Ph.D. at Kiel in 1844, and in 1845–47 was mineralogist to the *Galatea* expedition around the world. In 1848–51 he was engaged in explorations of northern Greenland, and his subsequent life was devoted to the affairs of that country. He was inspector of southern Greenland in 1857–71; and in 1871–82 he was director of Greenland's trade in Copenhagen. He afterward lived in Christiania. Author of ‹Die Nikobarischen Inseln› (1847); ‹Gröuland geographisk og statistisk beskrevet› (2 vols., 1852–57; Eng. trans., ‹Danish Greenland,› 1877); ‹Eskimoiske Eventyr og Sagn› (1866; Eng. trans., 1879); ‹The Eskimo Tribes› (1887); ‹Gröuländere og Danshe i Gröland› (1887), etc.

**RIO BRANCO,** rē'ō brăng'kō, a large river of Brazil, entirely in the state of Amazonas. It rises on the eastern slopes of the Serra Parima, near the sources of the Orinoco, flows eastward parallel to the Serra de Pacaraimo, turns southward before reaching British Guiana, and joins the Rio Negro about lat. 1° 25′ S., long. 61° 10′ W. It has a length of about 830 miles and receives numerous affluents.

**RIO CUARTO,** koo-är′tō, Argentina, a town of Cordobá province, near the source of the Cuarto River, on the Trans-Andean Railroad midway between Belleville and Villa Mercedes, 119 miles south of Córdoba. It is the distributing centre of a large agricultural region. Pop. about 25,000.

**RIO GRANDE,** rē′ō grand-ā, or **RIO GRANDE DEL NORTE,** a river which rises in the southwestern part of Colorado, flows south and southeast into New Mexico, when its general course, about half-way across the State, is south by west, then south by east to El Paso (q.v.), whence it forms the irregular boundary between Texas and Mexico. It enters the Gulf of Mexico after a course of nearly 1,900 miles. It is navigable for small boats only to Kingsbury Rapids, near Presidio, about 460 miles from its mouth. In the upper course the banks are generally high, and the irregular rocky beds form rapids and waterfalls. In the lower part of its course the stream is shallow, and it is subject to periodical inundations. The largest tributary is the Pecos River, which enters the Rio Grande from Texas. A number of United States forts are on this river. The most important places on the Rio Grande are Brownsville, Eagle Pass, Laredo and El Paso in Texas; and Matamoros and Nuevo Laredo in Mexico. A few villages and towns of importance are on the banks of the river in New Mexico.

**RIO GRANDE DE CAGAYÁN,** rē′ō grän′dā dā kä-gä-yän′, the largest river of the island of Luzon, Philippines. It rises on the northeastern slope of Carabellos Sur, and flows north in a winding course to the China Sea. It drains a large territory, and has numerous tributaries, the chief of which are the Magat and the Chico de Cagayán. Its valley is very fertile, the land being used mainly for the cultivation of tobacco. The river is navigable for vessels drawing 12 feet as far as Lalló, 13 miles from its mouth; and for light draft vessels for 200 miles in the wet season. Freshets occur at times with a rise of several feet in a few hours.

**RIO GRANDE COLLEGE,** located at Rio Grande, Ohio; founded in 1876 under the auspices of the Free Baptists. It offers a classical and a scientific course, and confers the degrees of bachelor of arts and bachelor of science. There is also a preparatory department. The college is coeducational, and women constitute fully one-half of the student body. The grounds and buildings in 1923 were valued at $200,000; the library contained over 5,000 volumes; the productive funds amounted to about $190,000; and the annual income to $25,000. The students in collegiate department, the preparatory, normal, music, elocution departments and the summer school numbered 517 in 1923.

**RIO GRANDE DE MINDANAO,** rē′ō grän′dā dā mēn-dä-now′. See MINDANAO, GRANDE DE.

**RIO GRANDE DO NORTE,** rē′ō grän′dā dŏ nōr′tā, an important maritime state in the northeast of Brazil; area, 22,196 square miles. The surface is mountainous in the south and southwest, where it is covered by several mountain ranges. The principal rivers have all either a north or an east direction. The proximity to the equator makes the climate intensely hot. It is, however, not unhealthful. The soil is generally good, but not remarkable for its fertility. For a long time sugar cane was the principal cultivated crop, but considerable tracts formerly devoted to it are now occupied by cotton, which may be regarded as the staple product of the province. The other leading crops are mandioca (cassava), millet and haricots (kidney beans). Many of the plains are grazed by large herds of horses and cattle. The minerals include gold, silver, iron, salt, amethysts and rock-crystals, limestone, sandstone and granite. The forests are not very extensive. Pop. 430,000.

**RIO GRANDE DE LA PAMPANGA,** rē′ō grän′dā dā lä päm-pän′gä. See PAMPANGA, RIO GRANDE DE LA.

**RIO GRANDE DO SUL,** rē′ō grän′dā dŏ sool, a southern maritime state and the best known of all the states of Brazil; area, 91,336 square miles. Along the cost for more than half the extent of the coast-line of this state stretches the great Lago dos Patos, which communicates with Lake Mirim, and which receives the rivers of the southeastern part of the territory. Those to the southwest belong to the basins of the Paraná and Uruguay, and flow west. The mountain chain called Serra Geral divides the state into two unequal parts. The sea-coast is flat and sandy, and is lined by a series of reefs, which make navigation dangerous. The interior, partly occupied by arid serras, is mostly fertile. The climate is temperate, and the productions are more like those of Europe than of the rest of Brazil. Maize, rice, potatoes, mandioca, black beans and flax, particularly the first, are largely cultivated. The finer European fruits, especially figs and peaches, find a genial soil. The minerals of the state include gold, iron, sulphur and porcelain clay of the finest quality. There is a large foreign population in Rio Grande do Sul composed principally of Italians, Germans, Portuguese, Spanish and Spanish-Americans, with a few English, Americans and Belgians. The Germans number over 200,000 and the Italians even more. The chief occupation of the inhabitants is the rearing of cattle, horses and mules, and the preparation of dried beef. A number of German colonists and many Italians have settled in the state. There are several railways. Porto Alegre, about 100,000, is the capital. Pop. of the state 897,455. See BRAZIL.

**RIO DE JANEIRO,** rē-ō dā zhä-nä′rō, Brazil, one of the maritime states on the southeast coast of the republic; area, according to official returns, 26,634 square miles. The central part of this territory is mountainous, being traversed generally from east to west by a series of ranges, of which the loftiest and most conspicuous is the Serra dos Orgãos or Organ Mountains (q.v.). They are almost entirely composed of granite. The mountains slope down on the north and south — in the former direction toward the basin of the Parahyba, to which all the surface of the province on that side belongs; and in the latter to the coast, which receives the drainage from a great number of comparatively small streams, each carrying its waters directly to the ocean. The shore toward the northeast is lined by numerous lakes and lagoons. The soil does not seem to possess much natural fertility. A great part of it consists of a retentive clay, ill-adapted for agricultural operations; but the warmth and moisture of the climate are so favorable to vegetation that magnificent forests and valuable crops exist, and there are many tracts of the richest land which are turned to the best account. The crop which attracts the largest share of attention is coffee. The other leading crops are sugar, rice, millet, mandioca and cotton. The forests are rich in timber, both for ordinary and ornamental purposes, in dye-woods, gums, balsams and valuable medicines. The domestic animals, originally imported from Europe, have increased considerably, and immense herds of cattle are reared. This province is not rich in precious metals. Iron, however, abounds, though it is not much worked; and the decomposition of granite has formed extensive beds of the finest kaolin. The state assembly used to meet at Nictheroy, but Petropolis is the present capital. Under separate jurisdiction from the state is the federal district of Rio de Janeiro, embracing the city of the same name (q.v.) and its surroundings. The population of the state exclusive of the federal district is 1,250,000.

**RIO DE JANEIRO,** capital of the United States of Brazil; socially and commercially the most important city of South America, excepting Buenos Aires. It is situated in the federal district which comprises 538 square miles. The name is supposed to perpetuate an error of the discoverers (1 Jan. 1502), who, seeing the great length of the bay, assumed that it was the mouth of a river (*rio*). It is, in fact, a capacious and excellent natural harbor, one of the largest in the world, with an area 68 square miles greater than the combined areas of the lower and upper bays of New York. It is 17 miles long, 15 miles wide and has 45 miles of coast line. But the bottom silted up so much in recent years that the water near the shores became too shallow for large vessels. Accordingly, some of the old mooring places were abandoned. Merchant vessels unable to reach the docks cast anchor on the north side of the city, and their cargoes were transported in lighters. The entrance to the bay is less than a mile wide and is sheltered by high mountainous elevations. Modern facilities for handling freights were provided for in 1904; and the plans for the improvement were drawn by a commission of Brazilian engineers. A wide quay of solid masonry extends along the northern front to a deep artificial channel. The outer wall of this quay for about two miles is accessible to the largest shipping, and railway trains run to the same point. The new quays are very extensive and are equipped with cranes, warehouses, railway track and all the facilities of a modern harbor. The harbor has been drained to such a depth that ocean-going vessels can load and unload without the aid of lighters, which not long ago formed such an important feature of the harbor. The city proper is very compactly built on flat land adjoining the bay, but its suburbs stretch out along the shores for miles. Above the crowded central portion rises Sugar Loaf Peak (Pão d'Assucar), and on the same side of the harbor is the fortress called São Joã — opposite which, on the eastern promontory, is Santa Cruz fortress. A small island, lying in the entrance between São João and Santa Cruz, is also fortified; and other defensive works are located in the bay on an island, which takes its name from the French adventurer Villegaignon, who tried to establish a colony of Huguenots there (1555–60). The main body of the city is divided into regular squares by narrow streets, along which pass lines of electric cars. The National Museum, formerly the Imperial Palace of Boa Vista, is in the district of São Christovão. Some of the finest buildings, the Senate, City Hall, Mint, Normal School and Quartel-general, surround the old park, Praça 15 de Novembro, now called Campo de Sant' Anna. The Department of Foreign Relations occupies the old palace of Itamaraty. The present govenment palace was formerly the luxurious residence of Conde de São Clemente. The Chamber of Deputies, Department of Telegraphs and Historical Institute are installed in the old Poço Palace. A fine modern building is devoted to the Department of Industry. An especially interesting feature of the city is the Botanical Garden, in which rare exotics from all countries of the globe are cultivated, side by side with specimens of the flora of the various parts of South America. The cathedral and church of Santa Cruz stand near the water front, in a large square from which starts the main business street, Primeiro de Março. Rio de Janeiro is the chief industrial and commercial centre of Brazil. The very large wholesale and foreign trade of the city is largely in the hands of Portuguese, Brazilian, English, German and French merchants. In the list of exports, coffee is the principal item. Imports consist chiefly of food products and manufactured articles. There are at Rio cotton mills, furniture manufactories, flour mills, textile factories other than cotton, shirt, shoe, collar and stocking factories, hydrogen gas plant, railway car works, lumber mills, breweries, distilleries, canned food factories of various kinds, chemical works and a long list of other industries, over 600, covering most human activities, foundries, dry docks and a naval arsenal. A system of railways, of which the capital is the centre, covers the state and the southern part of Minas Geraes. The «Brazil Central» system, the most important in the republic, connects Rio with São Paulo, and has a large number of branch lines, controlling the terminal facilities of the port and the suburban traffic. Rio de Janeiro is the principal market for the coast trade in fish; and it receives from 35 to 40 per cent of the country's imports, while one-fifth of all Brazilian coffee passed through its port. Population of the city about 1,000,000.

**RIO NEGRO,** rē'ō nā'grō («black river»), the name of numerous streams, of which two are important: (1) A river of South America and principal tributary of the Amazon. It rises in Colombia and joins the Amazon, after a course of about 1,000 miles, at Manáos, Brazil. The Rio Negro together with the Naupés is between 1,400 and 1,500 miles in length. Through its affluent, the Cassiquiari, there is direct communication between the Amazon and Orinoco. Ocean steamers ascend the river to Manáos, the chief shipping point for the rubber collected in the interior far up the river. (2) A river of South America forming the boundary between the Argentine Republic and Patagonia. It rises in the Andes in Chile and is over 700 miles long. Its current is very rapid and its bed obstructed with shoals and sand banks. It is navigable, under some difficulties, for nearly 600 miles.

**RIO DE LA PLATA,** rē'ō dā lä plä'tä. See PLATA, RIO DE LA.

**RIO TÉODORE,** or **THEODORO,** formerly known as RIO DUVIDA (River of Doubt), a river of Brazil, rising in the Corde heira dos Parecis, in the western portion of Matto Grosso, flowing in a northerly direction from about the 13° to the 5° of lat. S., and between the 59° and 60° of long. W., and emptying into the Maderia, an affluent of the Amazon. It is the largest affluent of the Maderia, about equal in size to the Hudson, with many rapids and falls. Its length is nearly 1,000 miles. The lower course of the river had long been known to the rubbermen, but the upper course, traversing an unexplored portion of western Matto Grosso, was entirely unknown, and no part of the river was recorded on the maps. When the Roosevelt-Rondon expedition was starting on its exploring trip through southern and western Brazil in 1914 Colonel Roosevelt was approached by the Brazilian Minister of Foreign Affairs, Mr. Lauro Müller. Mr. Müller was intensely interested in the development of the interior of Brazil, and asked Colonel Roosevelt to undertake the exploration of the Rio Duvida, of whose source or course nothing was known beyond its lower waters. The announcement of the exploration of a hitherto untraversed and unmapped river caused considerable comment and even doubt upon Colonel Roosevelt's return in the autumn of 1914, but he established the course and identity of the new river without difficulty. It was at first christened Rio Roosevelt, but later was formally designated as Rio Téodore by the Brazilian government. Consult Roosevelt, T., 'Through the Brazilian Wilderness' (1914).

**RIOBAMBA,** rē-ō-bäm'bä, or **BOLIVAR,** Ecuador, a town on the Pastasa River, a branch of the Amazon, about 100 miles from Quito. A former town of the same name, at the foot of Chimborazo Mountain, about nine miles from the present town, was destroyed by an earthquake in 1797. Riobamba, which is the capital of the province of Chimborazo, has a population of about 25,000, most of them Indians.

**RIOJA, Francisco de,** frän-thēs'kō dā rē-ō'hä, Spanish lyric poet: b. Seville, about 1583; d. Madrid, 8 Aug. 1659. He studied first law and then theology in his native city. The minister Olivarez obtained for him a prebend in the cathedral of Seville, and he became royal historiographer, inquisitor at Seville and, lastly, inquisitor of the supreme tribunal of the holy office. The downfall of his patron involved his own. He was imprisoned and obtained his liberty only after he had undergone a formal trial and completely established his innocence. Philip IV, whose favor he had regained, made him director of the royal library and councillor in the Supreme Court of the Inquisition. As a poet he formed himself on the classic and Italian models, particularly Horace and Seneca; kept himself, in style and language, free from the tasteless eccentricities of his contemporaries, and thus preserved the true spirit of the lyric. His 'Silvas' exhibit rich pictures of rural life, remarkable for their truth to nature. His works were published with a biography by D. Cayetano de la Barrera, 'Poesias' (1868); and 'Adiciones a las poesias de D. Francisco de Rioja' (1872). Consult Longfellow, 'Poets and Poetry of Europe' (1843).

**RIOJA, La,** Argentina, a western province north of San Juan and south of Catamarca, with an area of 69,502 square miles, divided into 18 departments. While in the east and south there are salt and sand deserts, it is well watered on the west, and agriculture and cattle rearing are important industries. Excellent wheat, fruits and wine are produced. The climate is dry and healthful. Near Chilecito and Famatina are valuable gold, silver and copper mines, and the province contains gypsum, salt, graphite and coal. Pop. about 110,000. The capital of the province is La Rioja, a town of 10,000 inhabitants at the foot of Mount Belasco, 118 miles southwest of Catamarca, with which it is connected by railway and public highway. It contains a state college and a normal school.

**RION,** rē-ōn', or **RIONI,** rē-ō'nē, the ancient **PHASIS,** a river of Colchis (Transcaucasia), anciently regarded as the boundary between Europe and Asia. It was afterward held as the boundary line between Colchis and Asia Minor. It rises in a spur of the Caucasus (Moschici), and after receiving the rivers anciently called the Rhion, the Glaucus and the Hippus, it falls into the Euxine near the ancient town of Phasis. In the early part of its course it was called the Boas. Other rivers were sometimes confounded by ancient writers under the same name with this. The Phasis of Xenophon was the Araxes.

**RIORDAN, Patrick William,** American Roman Catholic archbishop: b. New Brunswick, 27 Aug. 1841; d. 27 Dec. 1914. He was educated at Notre Dame, Ind., and was graduated from Louvain, Belgium, in 1864. He then returned to Chicago, accepted the chair of theology at the Seminary of Saint Mary's of the Lake, and in 1868–71 was pastor of Saint Mary's Church at Joliet, Ill. From 1871–83 he was in charge of Saint James' Church, Chicago, and in the latter year was consecrated titular archbishop of Cabesa and was made coadjutor. He succeeded to the see of San Francisco in 1884.

**RIORDAN, Roger,** American artist and author: b. Ireland, 1848; d. 1904. He studied art at the Art Students' League in New York, contributed as illustrator and writer on art subjects to various magazines and served on the international jury of awards at the Paris Exposition, 1900. He published 'Sunrise Stories, a Glance at the Literature of Japan'; 'French Etchers' and collaborated on the catalogue of the Marquand collection.

**RIOT** (O. F. *riot,* ryote), a disturbance of the public peace, attended with circumstances of tumult and commotion, as where an assembly destroys, or in any manner damages, seizes or invades private or public property, or does any injury whatever by actual or threatened violence to the persons of individuals. By the common law a riot is an unlawful assembly of three or more persons which has actually begun to execute the common purpose for which it assembled by a breach of the peace, and to the terror of the public. A lawful assembly may become a riot if the persons assembled form and proceed to execute an unlawful purpose to the terror of the people, though they had not that purpose when they assembled. In England every person convicted of riot is liable to be sentenced to hard labor. In Scotch law rioting is termed mobbing. A person may be guilty of mobbing who directs or excites a mob, though he is not actually present in it. Mere presence without participation may constitute mobbing. A majority of the States of the American Union have riot acts somewhat similar to those of England, and the common law governs where no statutes have been enacted. A riot against the government with the purpose of overthrowing it is treason. However, an uprising of this kind is not generally called a riot.

**RIOUW-LINGGA,** rē'ow lĭn'gạ, or **RIOU,** or **RIO LINGA,** an archipelago southeast of the Malay Peninsula, belonging partially to the Netherlands. It is formed of two groups of islands; the northern group is that of Riouw, and the southern, Lingga. There are about 30 islands in the Riouw group; the largest, Bintang, has an area of 400 square miles. Lingga, of the Lingga group, has an area of 320 square miles; Singkep, 204 square miles. The soil of the greater part of the archipelago is fertile and the whole is well wooded. The principal export is gambir; other exports are pepper, sago and rice. Tin has been mined and exported for many years. The original inhabitants have nearly all disappeared. The capital of the Dutch residency is Rio (Riouw). The population now is made up of Chinese, Japanese, Javanese and Kings. Pop. about 80,000.

**RIP VAN WINKLE,** rĭp van wing'kl, a character in one of Washington Irving's legends of the Hudson Valley. While hunting among the mountains he falls in with the reputed followers of Hendrik Hudson and by drinking the liquor they offer him is cast into a sleep of 20 years. When he awakes and returns to the village of Laughing Water, he finds all things changed, but is chiefly relieved to discover that his wife, the irritating obstacle to his easy-going life, is no longer alive. The story was dramatized by Joseph Jefferson (q.v.) and formed one of the important rôles in his repertory. This version of the play was first performed in London in 1865.

**RIPARIAN RIGHTS** are those of one who owns the land bounding upon a watercourse; such owner is the proprietor of that portion of the bed of a river which adjoins his land; such rights upon navigable waters depend largely upon statute and customs of the different jurisdictions. A riparian owner has the right of access to navigable water, and for that purpose to erect a wharf or pier, provided it does not encroach upon the navigable waters sufficiently to interfere therewith. A riparian owner has also a right to the accretions of the soil and to fish in the adjacent waters; he has also the right to have the stream flow naturally without changing it in quantity or otherwise. Such owner is not entitled to the water, but merely to its use, and is without the right to divert, obstruct or corrupt the stream, except to build such lawful obstructions as may be necessary for bridges, wharves and dams. Riparian rights of property are established property, of which the owner cannot be deprived except by due process of law. See RIVERS.

**RIPLEY,** rĭp'lĭ, **Eleazar Wheelock,** American soldier: b. Hanover, N. H., 15 April 1782; d. West Feliciana, La., 2 March 1839. He was graduated from Dartmouth College in 1800, engaged in law practice and in 1811 settled at Portland, Me. In 1810–11 he was a member of the Massachusetts legislature, served as speaker in the latter year and in 1812 was elected State senator. At the outbreak of the War of 1812 he entered the army, became brigadier-general in 1814, and for services at Niagara, Chippewa and Erie was voted a gold medal by Congress. He remained in the army until 1820 when he removed to Louisiana and resumed the practice of law. He afterward served in the State senate and was a member of Congress from 1835 until his death.

**RIPLEY, George,** American author: b. Greenfield, Mass., 3 Oct. 1802; d. New York, 4 July 1880. He was graduated at Harvard in 1823, studied theology at Cambridge and in 1826 was ordained a Unitarian minister in Boston. He became interested in the principles of Fourier, Comte and St. Simon and made translations of the writings of modern German and French philosophers and endeavored to introduce their ideas in America. He collaborated with Dr. Hodge on a large work in 14 volumes, 'Specimens of Foreign Standard Literature' (1838–42). His 'Discourses on the Philosophy of Religion' (1839) gave rise to a long and bitter controversy with Prof. Andrews Norton of Cambridge. He was a leader in the Transcendental Movement originating in 1836 in association with Emerson and others, and wrote frequently for *The Dial,* the organ of that movement. In 1841 he definitely retired from the ministry and became prime mover in the communistic enterprise of Brook Farm (q.v.), and in 1844 invested all his small fortune in that settlement in West Roxbury. After the burning of the phalanstery in 1846 and the consequent dispersion of the colony, he went to New York as literary editor of the *Tribune;* contributed also to the literary department of *Harper's Monthly.* With Bayard Taylor he edited a 'Handbook of Literature and Fine Arts' (1852), and in 1858, with Charles A. Dana (q.v.), began the editing of 'Appleton's New American Cyclopedia.' Consult Frothingham, 'George Ripley' (1882); Swift, 'Brook Farm' (1900).

**RIPLEY, James Wolfe,** American soldier: b. Windham, Conn., 10 Dec. 1794; d. Hartford, Conn., 16 March 1870. He was graduated at West Point in 1814, served in the second war with Great Britain, his first engagement being in the defense of Sackett's Harbor. In 1818 he was promoted lieutenant, fought in the Seminole War and was appointed commissioner to establish the boundary line of the Florida reservation in 1823–24. He was captain in command of Charleston Harbor at the time of the nullification troubles in 1832–33, and in 1841–54 was superintendent of the Springfield armory. He was brevetted lieutenant-colonel in 1848 for services in the Mexican War, receiving full rank in 1854. He was promoted brigadier-general in 1861, and after 1863 was inspector of fortifications on the coast of New England. He was brevetted major-general in 1865.

**RIPLEY, William Zebina,** economist: b. at Medford, Mass., 13 Oct. 1867. He graduated at the Massachusetts Institute of Technology in 1890; A.M., 1892, and Ph.D. 1893 at Columbia University; and was professor of economics, Massachusetts Institute of Technology 1895–1901; lecturer on sociology, Columbia University 1893–1901; and from 1901, professor of economics at Harvard. In 1900–01 he was expert agent on transportation, United States Industrial Commission; Huxley Memorial lecturer, Royal Anthropological Institute, London, England, 1908; and lecturer at Columbia University 1915–16. He is author of 'Financial History of Virginia' (1890); 'The Races of Europe' (Lowell Institute lectures, 1900); 'Trusts, Pools and Corporations' (1905); 'Railway Problems' (1907); 'Railroads: Rates and Regulation' (1912); 'Railroads: Finance and Organization' (1914). Editor of selections and documents in economics (8 vols.): also many articles in periodicals.

**RIPLEY,** Ohio, village in Brown County, on the Ohio River, and on the Chesapeake and Ohio Railroad, 45 miles southeast of Cincinnati. It was founded about the time of the War of 1812, and was first called Staunton; later its name was changed in honor of General Ripley, an officer in the war. For a time the County Courts were held here, but the county-seat was finally moved to Georgetown. The first station on the «underground railway» for runaway slaves was located in Ripley. It is in a noted tobacco region and has a number of tobacco packing-houses and factories; its other industrial establishments include a piano factory and shoe factories and it carries on a considerable river trade. Pop. 1,840.

**RIPON,** rip'ŏn, England, a cathedral city in the county of York (West Riding), on the Ure, 22 miles by rail northwest of York. The cathedral of Saints Peter and Wilfrid, dating as far back as the 12th century and restored 1862–76, is one of the finest churches in England; length, east to west, 266 feet; width of transept, 132 feet; the three towers 120 feet high were crowned by spires prior to 1660. The abbey of Ripon was founded in the 7th century, and the Saxon crypt of the cathedral was probably built by Wilfrid in 674–678. The see of Ripon was established in 1836. The city has also other fine ecclesiastical, municipal and benevolent institutions. The principal manufactures are machinery, saddle-trees, leather and varnish. An obelisk 90 feet high is situated in the centre of the market place. Pop. about 8,250.

**RIPON,** Wis., city in Fond du Lac County, on Silver Creek, an inlet of Green Bay, and on the Chicago and Northwestern and the Chicago, Milwaukee and Saint Paul railoads, about 85 miles northwest of Milwaukee and 18 miles west by north of Fond du Lac.

Ripon was settled in 1844 by the «Wisconsin Phalanx,» an organization of 19 members, founded at Southport, Wis., based upon Fourier's principles. The city was named Ripon by John Homer, whose ancestors had lived in Ripon, England. The «Phalanx» prospered and held together as an organization for six years. The reports of gold in California was one of the causes of unrest which led to the voluntary and peaceable disbanding of the organization in 1850. The city was incorporated in 1849 and chartered in 1858. Ripon claims to be the birthplace of the Republican party, and one of the historic buildings is pointed out as the place where the first meetings were held and where the party received its name. The chief industrial wealth of the city is connected with the products of the rich farms of the valley. Grain, fruit and vegetables are abundant, and the dairy products are of considerable value. The chief manufacturing establishments are knitting works, glove factory, grain elevators, washing-machine works, veneer works, carriage works, machine shops, and pickling works, creameries, box and crate factories and flour and feed mills. There are several churches and a number of fine business blocks. The educational institutions are Ripon College, organized in 1851; a high school, graded elementary schools, a parochial school and a free public library. The three banks have a combined capital of over $2,000,000. The government is vested in a mayor and a council of eight members, who hold office two years, four of whom are elected each year. Ripon is a favorite summer resort on account of its climate, beautiful scenery and the attractive drives to nearby points of interest. Pop. 4,090.

**RIPON COLLEGE,** located at Ripon, Wis., organized in 1850. It was founded under the name of Brockway College and received its present name in 1863. Though the Congregationalists have contributed largely to its support and prosperity, it is not under denominational control. Its organization includes a collegiate department, a preparatory department and departments of music and of art; normal courses are also given. In 1901 the group system of elective studies was adopted and a new professorship in history and economics established; the collegiate courses are arranged in three general groups, classical, literary and scientific, but only the one degree of A.B. is conferred. Women are admitted to all departments. The campus includes 10 acres; the library contains 20,843 volumes The students for the year 1922–23 numbered 415, and the faculty 29.

**RIPPLE MARKS.** See section on *Structure* in the article on GEOLOGY.

**RISE OF THE DUTCH REPUBLIC, The,** a historical work by John Lothrop Motley, first published in 1856. It proved an immediate popular success, and was followed by a French translation (supervised with an introduction by Guizot) in 1859, and soon after by Dutch, German and Russian translations.

**RISE OF SILAS LAPHAM, The.** 'The Rise of Silas Lapham,' by William Dean Howells, on its first publication in 1884 won a popular and critical approval which speedily assigned it to a place among the classics of realistic fiction, perhaps the chief American novel in that type. Compared with other books by the same author, it is hardly as great in range or as broad in canvass as ‹A Hazard of New Fortunes,› hardly as disconcerting by its pungent accuracy as ‹A Modern Instance,› hardly as winged with laughter as ‹Indian Summer,› but it goes beyond any of them in its combination of qualities. Its theme is the universal one, particularly dear in a republic, of the rising fortunes of a man who has had no aid but virtue and capacity. Silas Lapham appears when he has already achieved wealth, and finds himself drawn, involuntarily enough, into the more difficult adventure of adjusting himself and his family to the manners of fastidious Boston. A writer primarily satirical might have been contented to make game of the situation. Howells, neatly as he hits off the conflict of standards, gives it the depth of meaning which comes only from a profound understanding and a mellow pity. The conflict, however, while constantly pervasive in the book, does not usurp the action, and the Lapham family has serious concerns that might have come up anywhere. Most intense and dramatic of these is the fact that the suitor of one daughter is believed by the whole family to be in love with the other until the very moment of his declaration. The distress into which they are thrown and the methods by which they free themselves from the predicament are presented with a degree of subtle comprehension rare in any novel, and here matched with an equally triumphant commonsense. Indeed, a certain rightness of feeling, equally removed from satire and sentimentalism, may perhaps be called the book's essential merit. As the story proceeds, as Lapham falls into heavy financial vicissitudes, finally to comparative poverty again, and yet through all this actually rises in spiritual worth, the book steadily grows in the dignity which is founded on truth. Without a touch of heroics in style or events, trusting confidently that to be veracious will suffice, it abounds in memorable revelations of human character and wisdom.

CARL VAN DOREN.

**RISHI**, rĭ'shĭ or r'shĭ, sages of the Hindu mythology, sprung from the mind of Brahma, and attendants in alternate months on the sun. Seven of them are enumerated. The rishi are connected with the star worship; and the seven rishi form the constellation of Ursa Major in the Hindu astronomy. The rishi were also inspired sages, of whom the Vishnu Purana enumerates three kinds — royal rishi, or princes, who have adopted a life of devotion; divine rishi, who are both sages and demigods, and Brahman rishi, or sons of Brahma. «Rishi» afterward came to be applied to all personages distinguished for piety and wisdom. Consult Macdonell, A. A., ‹History of Sanskrit Literature› (London 1913).

**RISORGIMENTO, The.** The Italian word, «risorgimento» means literally «rising again.» In some of its verb forms the word is seen to be cognate with our «resurrect.» In Italian history the meaning of the word is the rebirth or remaking of the Italian nation. It thus covers the period of revolt from Austrian domination and establishment of the present kingdom — the risorgimento was the foundation of united Italy. It began in 1831, when Mazzini founded «young Italy.» The influential paper which Cavour edited in the stirring midcentury was called *Il Risorgimento.*

**RISTORI**, rēs-tō'rē, **Adelaide**, Italian actress: b. Cividale, Italy, 29 Jan. 1822; d. Rome, 9 Oct. 1906. She appeared on the stage as a child, and her early parts were in Soldoni's comedies. After her marriage in 1846 to the Marchese Giuliano del Grillo she retired from the stage for a time, but after her return she devoted herself thenceforth to tragic rôles. In 1855 she appeared in Paris in Silvio Pellico's tragedy of ‹Francesca da Rimini› and achieved a great success. Her engagement there was followed by a tour of Europe; and from that time she was frequently seen in the large cities of the Continent and Great Britain. She made her first appearance in America at the Lyric Theatre, New York, 20 Sept. 1866, and her tour of the United States lasted for eight months. In 1869 she played in South American cities and in 1874 made a journey round the world. She made her fourth and last visit to the United States in 1884–85, and during that tour, which ended in May of the following year, she appeared as Lady Macbeth in company with Edwin Booth. After 1885 she did not appear on the stage. Her greatest parts were Mary Stuart, in Schiller's drama ‹Myrrha,› Medea, Phædra, Lady Macbeth and Queen Elizabeth. Consult Mantillini, G., ‹Memories and Artistic Studies of Adelaide Ristori› (a translation of her own autobiography; Garden City, N. Y., 1907).

**RITCHEY, George Willis**, American astronomer: b. Tuppers Plains, Ohio, 31 Dec. 1864. He was educated at the University of Cincinnati. He was superintendent of instrument construction at Yerkes Observatory in 1899–1904; was connected with the faculty in astronomy at the University of Chicago in 1901–05; and in 1905–09 he was astronomer and superintendent in charge of instrument construction at the Solar Observatory, Carnegie Institute. In 1909 he became astronomer and engineer in charge of the designing and construction of a 100-inch reflecting telescope.

**RITCHIE**, rĭch'ĭ, **Alexander Hay**, American artist: b. Glasgow, Scotland, 14 Jan. 1822; d. New Haven, Conn., 19 Sept. 1895. He studied under Sir William Allan at the Royal Institute, Edinburgh, went to Canada in 1841 and later settled in New York. He engaged in business as an engraver and established a considerable reputation for his work, which was chiefly of the mezzo-tint variety. He was also known as a painter. He was elected an associate of the National Academy in 1863 and academician in 1871. Among his paintings are ‹Mercy Knocking at the Gate› (1860); ‹Baby, Who's That?› (1871), etc. His engravings include ‹Mercy's Dream› (1850); ‹George Washington› (1852); ‹On the March to the Sea› (1868), etc.

**RITCHIE, Anna Cora Ogden (Mowatt)**, American actress and author: b. Bordeaux, 1819; d. Henley-on-Thames, near London, England, 28 July 1870. She was successful as a playwright and dramatic reader, and in 1845–54 appeared with much favor on the stage in both the United States and England, where she was seen with E. L. Davenport (q.v.). In London and Manchester she was leading lady to

Davenport. In 1854 she married W. F. Ritchie, editor of the Richmond *Examiner*, her first husband having died the preceding year. From this time on she retired from the stage and devoted her time to literature and play writing. Some of her books were published under the pseudonyms of «Isabel» and «Helen Berkley.» They include ‹The Fortune-Hunter› (1842); ‹The Mute Singer,› ‹Fashion,› a comedy (1847), which was very popular; ‹Evelyn› (1845); ‹The Autobiography of an Actress› (1854), the best-known and most popular of her productions; ‹Mimic Life› (1855); ‹Fairy Fingers› (1865); ‹The Clergyman's Wife› (1867). Consult ‹Autobiography of an Actress,› by herself (Boston 1854).

**RITCHIE,** Lady **Anne Isabella Thackeray,** English author: b. London, 1837; d. 1919. She was the eldest daughter of William Makepeace Thackeray (q.v.). She was educated at Paris and Kensington and in 1877 was married to Richmond Ritchie. Her first literary work was published in the *Cornhill Magazine* while her father edited that periodical. In 1863 she published ‹The Story of Elizabeth,› which met with success. From that time she published fiction, biography and literary reminiscences, among which are ‹The Village on the Cliff› (1865); ‹To Esther and Other Sketches› (1869); ‹Old Kensington› (1873); ‹Toilers and Spinners› (1873); ‹Bluebeard's Keys› (1874); ‹Miss Angel› (1875); ‹Anne Evans› (1880); ‹Madame de Sévigné› (1881); ‹A Book of Sibyls› (1883); ‹Mrs. Dymond› (1885); ‹Records of Tennyson, Ruskin and Browning› (1892). The biographical edition of Thackeray's works was edited by her, and her prefaces and notes contain a partial substitute for an authoritative biography against which Thackeray left a prohibition. Her ‹Chapters from Some Unwritten Memoirs› (1895) is a work of autobiographical character.

**RITCHIE, Thomas,** American journalist: b. Essex County, Va., 5 Nov. 1778; d. Richmond, Va., 12 July 1854. He studied medicine and later engaged in teaching, but in 1804 became owner of the Richmond *Examiner*. He changed the name of that paper to the *Enquirer* and acted as its editor for 40 years, making it an organ of unusual influence. In 1845 he acceded to the request of President Polk and, resigning the *Enquirer* to his two sons, he went to Washington and took charge of the *Union*, the administration paper. He retired in 1849. He was a strong advocate of State-rights and a picturesque and dominating figure in the political world.

**RITCHIE,** Sir **William Johnstone,** Canadian jurist: b. Annapolis, Nova Scotia, 28 Oct. 1813; d. Ottawa, 25 Sept. 1892. He was admitted to the bar of New Brunswick in 1838, was appointed queen's counsel in 1854 and served in the executive council of the province from 1854 until he was appointed puisne judge of the Supreme Court of New Brunswick in 1855. He became chief justice of New Brunswick in 1865; puisne judge of the Supreme Court of the Dominion in 1875, and was chief justice of Canada in 1879–92. He was knighted in 1881. He was deputy-governor of Canada in place of Lord Lorne for six months in 1881 and three months in 1882; and in 1884 was appointed deputy-governor under Lord Landsdowne.

**RITE AND RITUAL** (Latin, *ritus*, custom, connected with Sanskrit *ri*, and it is, therefore, from the same root as river, the thing that flows); in modern religious use any external sign or action employed as an expression of reverence or devotion, or as a means of exciting religious sentiments. The ancient religion of Judaism abounded in rites and ceremonies, and the sect or school of the Pharisees appears to have laid more stress on compliance with those observances than on the weighty injunctions of the law. Jesus Christ repeatedly expressed contempt for the scruples of the Pharisees, and many of those who aim to walk strictly in his footprints repudiate everything like ceremonialism in divine worship. But the vast numerical majority of Christians demand a more or less stately and impressive ceremonial. Rite is used also to express the sum of the ceremonial employed in the administration of the sacraments, as, the «rite» of baptism, the «rite» of confirmation, «the last rites.» The entire liturgical ceremonial of a particular branch of the Church is spoken of as a «rite,» for example, Latin rite, Greek rite and Syrian rite. All these, however, are but modern manifestations of very primitive communal ceremonies which, in the beginning, were very little, if at all, religious in point of view, in sentiment or in ceremonial execution. Rites represent the organization of religious procedure, generally throughout long ages. They may, therefore, be said to be the outward manifestation of religion, the dress which distinguishes one religion or one faith from another. They are when they appear to be individual, for the nature of the ceremonial rites performed in his own home by the individual is exactly similar in form and intent to that of the rites performed by all the members of the same tribe or primitive racial organization, under the same conditions and for the same ends. The individual rite is, therefore, nothing more or less than the resolution of the congregational rite into its component parts. On the other hand, the congregational rites represent the common interests of the members of the community. Both pertain to the common life in its general and yet most intimate functions and vital interests. In primitively organized society the rites were largely, if not altogether, intended to control or favorably influence those powers which, by common consent, were recognized as being greater than those possessed by man himself. But certain rites seem to have been intended to encourage certain beneficent beings, among them the gods of growth and fruition, to become even more favorable to man. Of such a nature were the great spring, summer and autumn festivals common to many races. To this category, too, belonged the ancient rites performed at birth, baptism, puberty, marriage and death and other inter-related ceremonies with their attendant, invariable rites.

**Ritual and Myth** march hand in hand down the long ages of time, extending mutual help to one another all along the way. Sometimes an elaborate myth apparently grows out of a tribal ceremony; and sometimes elaborate and complicated rites are built up about a racial myth. These act and react upon one another and are subject to extraneous influences which tend to modify the form and the spirit of all ceremonies and their attendant rites. Ritual is a generally recognized form of performing certain ceremonies growing out of the past experiences of a people of which they are commemorative. For this reason the origin of most rites must be sought in the long past, and the more primitive of them can be intelligently studied only in connection with their corresponding myths. The primitive belief in the animate nature of things animate and inanimate and in the magic power possessed by certain beings gave rise to the use of magic formulæ, spells and charms. He who possessed the most powerful of these was believed to be able to conquer adverse powers through them. These assumed certain ritualistic definite forms which it was not permitted to vary. With these forms went stories or myths explaining their origin and sometimes their efficacy and mystic signification. Certain ceremonies commemorative of the popularly believed origin of the myth commemorated the myth itself, and the ritual laid down the exact form in which the commemorative ceremonies were to be observed. These early ceremonies and rituals seem to have been all magical in form and intent. The efficacy of the magic or charm consisted in the performance of the ceremony in the exact manner and words prescribed by the ritual, by tradition and by custom. Hence the medicine men, myth guardians, instructors or by whatever name they were known in the various more or less primitive societies, spent years in becoming familiar not only with the ritual itself but with its attendant ceremony and its accompanying myth or myths. As society grew more complex and human interests more confederated, rituals became more complicated and their myths more involved. Thus the former became more difficult of performance and the latter required greater skill for their elucidation. The medicine men and myth guardians and elucidators were gradually forced to give all their time to this work. Thus a formal priesthood came into existence. The priests were the natural guardians of the traditions of the tribe or nation. As they were the magic workers they were looked upon with special reverence by the rest of the people, and they were feared on account of their supposed possession of powerful magic, charms and other mystic knowledge, all of which formed a complicated and extensive tribal ritual. As the powerful beings feared by primitive man developed into gods the medicine men became the sacred depositories of celestial knowledge and their ancient ceremonies and rituals were attributed to the revelation of the gods. In this connection they assumed an additional sacredness which tended still more to stereotype them.

**Ritual and Writing.**— Naturally all primitive religions have shown a fondness for cabalistic signs, and some of the more developed of modern religions still exhibit strong traces of this primitive influence. As religious rites and ceremonies became more complicated and complex, signs known only to the medicine men or priests were made use of as an aid to the memory in the memorizing of the ritual and attendant myths. Often signs of this kind were painted on the wigwams, altars or temples; and on account of this connection they assumed a sacred character. These signs naturally became more numerous and complicated with the extension of the primitive ceremonies and rites. When these first hieroglyphic signs grew into formal hieroglyphic writing they still remained the property of the priesthood, and as such retained their sacred character. The knowledge of writing was looked upon by the masses of the people as nothing less than very powerful magic, or in other words, a series of cabalistic charms or ritual. Hence the great culture gods of the races throughout all the ages of barbarism are represented as revealing to the human race the magic of the written word in which great power was believed to reside. Thus the Biblical expression: «In the beginning was the Word; and the Word was with God; and the Word was God,» is literally the attitude of the people of an earlier age toward the supposed miraculous attributes of the written word, representative of the divine rituals, incantations, charms, hymns and songs, all of which were, in themselves, but so many different forms of primitive rituals. Thoth, the great culture god of the Egyptians, was the revealer of writing to the human race. The books of Thoth, which seem to have consisted of religious rituals and a compilation of the scientific knowledge of the age, were looked upon as not only extremely sacred but as miraculously powerful; and strangely modern Egyptian romances recount the adventures of those who either tried to secure possession of Thoth's secret book or actually did obtain it and the terrible mishaps that befell them. In these stories the belief in the divine nature of writing is strongly in evidence.

**Ritual, Charms and Incantations** are essentially the same in origin. The efficacy of the charm or incantation depended upon its being recited in a certain prescribed form. The greater part of the worship of primitive races has always consisted of charms and incantations accompanied by offerings and sacrifices, which are but another form of offerings. The charms and incantations were made use of with a view to opposing powerful known magic to the great magic of the superior being addressed, while the offerings were made with a view to pleasing or propitiating him. In the course of time the ritual connected with these charms, incantations and their accompanying ceremonies became extensive and more or less obligatory in form. Gradually the dramatic picturesque ceremony superseded the charm element in the imagination of the participants in the ceremonies; and the ceremonial rites assumed a form of worship in which the being addressed continued, as time went on, to play a larger and more important rôle. But the idea of magic and charm was eliminated very slowly from the minds of the masses of the people. The formal ritual of the blessing of the water was believed to give it miraculous power; the rite of baptism was a more or less sure protection from the evil one. Marriage, from being one of the loosest and most irregular and non-formative unions, became, as the rite connected therewith assumed a complex and mystical form, one of the most sacred of religious and divine institutions enjoined by heaven and revealed by the deity. By the rite of anointment and inauguration the sovereign became a semi-divine character, the anointed of the Lord, the representative of heaven upon earth. Out of the rites, ceremonies and traditions rose the doctrine of the divine right of kings, which seems to have been at one time more or less universally subscribed to among civilized and semi-civilized forms of government. Baptism, as a rite, became, among Christians, of such importance that it was believed that without it no one could enter the kingdom of heaven. Auricular confession, too, assumed the form of a rite of the Church, though perhaps not originally specifically classed as such.

What has taken place in the Christian Church had already taken place in the great pagan religions of Greece, Rome, Carthage, Egypt, Babylonia, Assyria and India; and the same tendency was noticeable in the Jewish faith.

Everywhere a sacredness was ascribed to the religious ritual to which was also attributed a mysterious virtue of power strongly similar to the ancient charms and incantations about which most of the ritual was built. Every ceremony of a religious nature, among these races, had its accompanying ritual, rigid, unchangeable, obligatory in form and generally believed to be of wonderful efficacy. Some of these ceremonies with their accompanying rites were of such a complex nature and so extensive that the performance of them occupied a week or more each year and called forth the unrestrained energies of a people. Every important event in life has its corresponding ceremony and rite. This seems to have been an almost universal tendency of man in a certain stage of racial development. Among most of the races of North and Central America and the west and north of South America there were ceremonies and rites connected with birth, puberty, marriage, death, war, peace, springtime, harvest, the undertaking of a journey or the beginning of some important enterprise. The people of these regions possessed elaborate rites according to which the germination, ripening and gathering of the crops were celebrated. Every trade, guild or occupation had its patron deity, its holy day and a special ceremony and ritual connected therewith. With such a multiplicity of deities, naturally there was considerable similarity among the hundreds of rituals; and yet there were also some striking and spectacular differences.

**Secret Rites.**— In ancient religious and semi-religious societies the secret rites were frequently more elaborate and of far greater importance than the public rites. This is explained by the fact that the former were proprietary and, as such, naturally inspired greater personal interest and called for more detailed attention and elaboration. Where the secret rites existed, and they existed extensively in more primitive society, they were the really significant rites of the celebration, pregnant with meaning and associations for those privileged to take part in them, while the public rites were in general the drama or play, of a commemorative and informative nature presented for the general use and interest of the people. Many of the ancient Egyptian, European and Asiatic secret rites were widely spread and exercised profound influence upon the national life. Some of them, as the Eleusinian mysteries, possessed fine temples, elaborate rituals and thousands of devotees who performed all their important rites behind closed doors; and took into partnership with them in the performance of these rites certain of the deities. The secret part of these rites was looked upon as very sacred. The public rite soon became little more than a dramatic performance for the edification and entertainment of uninitiated masses; and as such it continued to degenerate.

Secret rites were a notable feature of the great religious ceremonies of the North American Indians in general. Almost always these secret rites were performed in a medicine lodge or great tepee erected for the occasion and dedicated to this use alone. Into this chamber none but the initiated may enter and it is marked by cabalistic signs which distinguish it from all other dwellings and give it at once a semi-sacred, semi-mysterious nature. Processions, dances, offerings, purification ceremonies, songs, incantations, prayers, all performed in a manner rigidly enjoined by the ritual, generally form part of the secret ceremonies of most of such societies. There too the priests and other participants rehearse the mythical story or legend of the origin of the society and its peculiar rites and ceremonies. Among most Indian secret societies one of the ever-present rites is that of smoking to the six directions of the universe, east, west, north, south, upward and downward. Often, too, an elaborate ceremonial feast forms part of the obligatory rite. This may be private or public or both, and is frequently preceded or followed by the sacrificial food offering. Not infrequently a public altar is erected by the masses of the people, under the direction of the priests, on a certain day or days set apart between the secret and public rites. This in itself may be said to form an integral part of the rites since it is of deep mystical symbolization, symbolizing some god, culture hero, the earth, the heavens, the universe according to the ritualistic tradition of the tribe. The rites of this altar and its symbolism frequently represent the four wind gods, the great and sovereign rulers of the four quarters of the earth, the thunder gods and the spirit of the rainbow, the long bridge spanning the earth-land and the sky-land. The public performance also follows an elaborate, rigidly-defined ritual, the prominent features of which generally are smoking, sacrifices, specific dances, dramatic presentations of legend and tradition, oratorical exhortations, prayers, processions and traditional songs generally sung by choruses. Masks are frequently worn and mythological characters are impersonated according to a plan rigidly defined and exacted in the tribal rite of the ceremony.

The tendency everywhere and at all time has been for ceremonial rites to become rigidly stereotyped, a fact due to the ever-present belief in the magic efficacy of the spoken word, of incantations and mystic signs presented in certain forms approved by antiquity and tradition. In ancient and modern ceremonial rites everything is ruled by precedent. From Rome to Egypt, from Persia to Hindustan and China, from Greenland to Yucatan, from Central America to Peru, even the decorations and symbols of the ceremonies and of the tepees and temples were fixed and practically unchangeable in the pre-Columbian days.

**Changing of Rites.**— This very unchangeableness of customs and ritual and the tend ency to relegate the most important and solemn of the rites to societies and lodges to associations of priests and nobles, and to reserve the spectacular and the dramatic for the great public performances had two tendencies which became invariably destructive of the ceremonies they were interested in preserving. A strong priesthood and a powerful privileged class elaborated these ceremonies and rites and read into them symbolical meanings they did not originally have, and overloaded the ritual, binding it soul and body to the secret societies and the ruling class. The symbols, in the course of time, became conventionalized and the original signification of the religious rites forgotten or obscured. Gradually for the masses, the celebration of the great ritualistic feasts became the occasion of a public holiday, often accompanied by licentiousness and debauchery. The meaning of the sacred or mystical symbols obscured or forgotten or a new signification read into them, they insensibly and gradually changed form or assumed stereotyped shapes to which semi-mystical, semi-magical powers were still attributed. Thus it was that the original temple decorations, once pregnant with meaning, became transformed into conventional decorations. In this latter shape they might still continue to attach themselves to the ritual of which they had originally formed an integral part. In the later Greek and Roman Classical periods the ritualistic decorations had become almost altogether conventionalized and their meaning obscured or lost. The Aztecs and Mayas, at the time of the Conquest, had arrived at the transition period when the ritualistic symbols were beginning to become stereotyped while still retaining most of their mystic signification. Among many of the northern Indian races mysticism and symbolism were still linked with the ritual and never used apart from it. These different grades of civilization illustrate well the insensible changes of ritual and its attitude toward its origin in the course of ages of social and religious evolution. Thus ritual, while apparently often stationary, is continually changing with the never-ceasing changes of the ages. This is due to the part that personal religion tends to be informal which state or tribal religions tend to wrap themselves about with ceremonies borrowed from court ceremonies and surroundings, vocabulary and relationship. Just as state ceremony tends to become top-heavy under autocratic governments and finally to fall by its own weight, so the ceremonies of state and tribal religions are born down by the weight of their own ritual, generally after centuries of slow growth and very gradual change leading to more and more ornate, involved and obscure symbolism. The whole course of ritual evolution is affected by the constant borrowings of races and creeds from one another, and the ever-present tendency to develop new forms from old.

The individualism of strong men has also, from age to age, had a very decided influence upon the upbuilding and new interpretation of ritual, or upon its simplification or total or partial destruction. This is well exemplified in Biblical history, in the growth of ritualism in the state religions of Egypt and those of Assyria, Babylonia and India; and more recently in the development of Christianity, first as an iconoclastic force directed against ritualism, and later as one of the greatest ritual-building agencies. This ritual-building was arrested and strongly affected by the individualism of such men as Zwingli, Erasmus, Calvin, Melanchthon and Luther, the most active leaders of the Reformation. Since their day the more individualistic leaders of Protestantism have made repeated attacks upon ritualism until now little or nothing of the original ritual remains in the more ultra Protestant churches, and with the ritual have disappeared much of the dogma of the Roman Church and many of the customs, traditions and practices inherited by it from the earlier ages of Christianity or from pre-Christian times. Much the same tendency is noticeable in the Mohammedan faith which has developed from a distinctly iconoclastic force, in its earlier days, into a strong fortress of ritualism.

**Contra-Currents.**— Where the tide is strong and constant in one direction there are apt to be contra-currents. This is true of the ever-constant tide of ritualistic change. Within the Protestant bodies there has ever existed a contra-current in favor of the preservation of the essentials of the rituals of the earlier Christian Church. Luther himself, though proclaiming doctrines destined ultimately to shake the throne of ritualism throughout the Christian world, was himself at heart a ritualist. The Anglican Church, though the most determined of opponents of Rome in the days of its early struggle, has clung tenaciously to much of the Roman ritual; while a certain section of the Anglicans still stand for elaborate ritualism and symbolism in formulas and service of the church. The Hindu religion has had the same experience, in a more pronounced manner, for numerous sects within the ecclesiastical body stand to-day for the maintenance or extension of ancient ritual. In Egypt, when the symbolism of the state church had become complex, extensive and elaborate, there were constant undercurrents, which on two, if not more, occasions succeeded, for a time, in getting the upper hand. In Mexico, under the Aztecs, in the later days of the Montezumas, there was a strong double reaction in favor of a return to the earlier ritual of the tribal nature worship. The headquarters of this reaction was in Texcoco, the old Chichimeca capital. So strong was this reaction, in the days preceding the Conquest, that it seemed in a fair way ultimately to overthrow the state religion of the Aztec Empire, which had already been so strongly affected by the efforts of the followers of the ancient Toltec faith that the statue of the chief Toltec divinity, Quetzalcoatl, god of the winds, had been set up in the great temple of Tenochtitlan (Mexico City) by the side of the chief of the national and state deities, and in many other temples throughout the Aztec Empire. In the history of the evolution or disappearance of ritual these contra-currents are constantly in evidence, working a change of direction, often in the main stream.

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**RITES, Congregation of,** a commission or standing committee of cardinals of the Roman Catholic Church, instituted in the 16th century by Sixtus V. Its function is to exercise supervision throughout the entire Church over all ecclesiastical rites and ceremonies, in particular those belonging to the mass, with a view to preventing the introduction of novelties without express approval, and to maintain unaltered the usages sanctioned by the tradition of the Fathers and the prescriptions of the rubrics. It is the Congregation of Rites that takes cognizance of all matters concerned with beatification and canonization.

**RITROVAMENTO.** See Invention of the Cross.

**RITSCHEL,** rĭch'ĕl, **Wilhelm,** American artist: b. Nuremberg, Bavaria, 11 July 1864. He studied at the Royal Academy, Munich, and in 1895 came to the United States. He has specialized in marines, and his paintings have been shown at important exhibitions in America and Europe. He was elected to the National Academy in 1914. Among his paintings are ‹Hauling up the Boats› (1908); ‹Midsummer Night, Maine› (1912); ‹Glory of the Morning, Pacific Coast› (1913), etc.

**RITSCHL,** rĭch'l, **Albrecht,** German theologian: b. Berlin, 25 March 1822; d. Göttingen, 20 March 1889. He studied at the universities of Bonn, Halle, Heidelberg and Tübingen, qualified at Bonn as a lecturer in 1846, became extraordinary professor of theology there in 1852 and ordinary professor in 1859. In 1864 he accepted a call to the corresponding chair at Göttingen. From 1874 he was a consistorial councillor. In his early thesis, ‹Das Evangelium Marcions und das kanonische Evangelium des Lukas› (1846), he adopted the position of his master, F. C. Baur, but in the first edition (1850) of his ‹Entstehung der altkatholischen Kirche› (‹Origin of the Early Catholic Church›) he showed signs of divergence, and the publication of the second edition of the latter work in 1857 marked his complete severance from the Tübingen school. His chief subsequent works are ‹De Ira Dei› (1859); ‹Die christliche Lehre von der Rechtfertigung und der Versöhnung› (‹The Christian Doctrine of Justification and the Atonement,› 3 vols., 1870–74), his chief work; ‹Schleiermacher's Reden über die Religion und ihre Nachwirkungen auf die evangelische Kirche Deutschlands› (1874); ‹Die christliche Volkommenheit› (‹Christian Perfection,› 1874); ‹Unterricht in der christlichen Religion› (1875; 5th ed., 1895); ‹Geschichte des Pietismus› (1880–86); ‹Theologie und Metaphysik› (1881); ‹Drei akademische Reden› (1887); ‹Fides Implicita› (1890); and ‹Gesammelte Aufsätze› (‹Collected Essays,› 1893 and 1896). Ritschl founded a school of theology still of much importance both in Germany and in other countries. Starting from a subjective theory of cognition, based upon the philosophy of Kant as developed in Lotze, he sought to eliminate the whole metaphysical element from religion. He was thus led to reject such doctrines as original sin, the Trinity, the incarnation, whether historic or mystical, and the whole of natural theology, as of no religious value, and he denied the pre-existence and miraculous birth of Jesus. He laid stress upon the historical character of Christianity, but held free views of inspiration and admitted the most advanced criticism. His view of the atonement was essentially the same as the «moral influence» theory of liberal theologians.

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**RITSCHL, Friedrich Wilhelm,** German classical scholar: b. Grossvargula in Thuringia, 6 April 1806; d. Leipzig, 9 Nov. 1876. He was educated at Leipzig and Halle, where he devoted himself to classical studies, and in 1832 was appointed extraordinary professor at Halle. He subsequently held professorships at Breslau and Bonn, and in 1865 accepted a call to Leipzig, where he remained until his death. He was a very popular and successful teacher. His chief work is a critical edition of Plautus' ‹Comedies› (1848–54, incomplete; entirely remodeled edition, 1881–94). His other works include ‹Parerga Plautina et Terentiana› (1845); ‹Priscæ Latinitatis Monumenta Epigraphica› (1864); ‹Opuscula Philologica› (his miscellaneous papers in 5 vols.). Consult Müller, L., ‹Life of F. W. Ritschl› (Berlin 1877); Ribbeck, O., ‹Life of Ritschl,› published in Leipzig in 1881; Sandys, J. E., ‹A History of Classical Scholarship› (Cambridge 1908).

**RITSON, Joseph,** English antiquarian: b. Stockton-on-Tees, England, 2 Oct. 1752; d. London, 23 Sept. 1803. He studied law, became conveyancer in London and deputy high bailiff to the duchy of Lancaster. For many years he devoted his time to antiquarian researches and the editing of rare books, and he assisted Sir

Walter Scott in preparing his work on the ‘Border Minstrelsy.’ His works include ‘Observations on Warton's History of English Poetry’ (1782); ‘Ancient Songs from the Time of King Henry II to the Revolution’ (1790); ‘Cursory Criticisms’ (1792); ‘Bibliographica Poetica’ (1802); ‘Ancient English Metrical Romances’ (1802). Consult Hastewood, ‘Some Account of the Life and Publications of the Late Joseph Ritson’ (London 1824); Nicholas, Sir Harris, ‘Letters of Joseph Ritson’ (London 1833).

**RITTENHOUSE, David,** American astronomer and mathematician: b. Germantown, Pa., 2 April 1732; d. Philadelphia, 26 June 1796. His great-grandfather, Willem Rittinghuysen, a Mennonite from Holland, in 1688 set up, on Wissahickon Creek, the first paper mill in America. From an uncle the boy inherited some books on calculation and geometry, and henceforth his life was determined. Mathematics and computation became his absorbing passion. He had great facility in mechanical invention and execution. In his 'teens he began to make clocks of wood and metal, and his father set him up in the business of maker of mathematical instruments and clocks. He is said to have independently discovered the method of fluxions or the calculus when but 19, and to have foreseen its vast utility, before he heard of the claims of Leibnitz and Newton.

In 1763 he laid out the 12-mile radius around Newcastle, which forms the boundary between Pennsylvania and Delaware, accurately with instruments of his own construction, and Mason and Dixon accepted his results as final. In 1769 he located the point where the 41st parallel of latitude, the boundary between Pennsylvania and New York, strikes the Delaware River. The same year the Pennsylvania legislature appropriated £200 toward the observations of the transit of Venus. Rittenhouse built an observatory near his home in Norriton, and in company with a committee appointed by the American Philosophical Society made preparations for the occasion. His results were the best obtained and the computed parallax of the sun the most accurate then known.

Rittenhouse invented the plan of placing spider lines in the focus of the telescope, an arrangement that has done more to make accurate measurements possible than almost anything else. In 1770 he completed his famous orrery based on computations of his own. This showed the movements of the planets and moons in elliptic orbits around their primaries, the phenomena of eclipses and the relative places of the members of the solar system over a time of 5,000 years preceding or following. For this he received £300 from Princeton University, and a like sum from the legislature of Pennsylvania for a second orrery for the University of Pennsylvania. The first was injured by the British troops in the Revolutionary War.

Then followed computations of the orbits of comets, surveys of the land between the Delaware and Susquehanna for canal purposes, calculations for almanacs and surveys for a series of dams to make the Schuylkill River navigable. He was engineer and finally president of the committee of safety of his State during the Revolutionary War, and plunged into military problems with all his energy. In 1776 he was made a member of the assembly of Pennsylvania, the earliest under the reorganized Revolutionary movement, and was active in the creation of the new constitution, the first for the State of Pennsylvania. In 1777 and for 12 successive years he was elected State treasurer. He was also trustee of the Loan Office.

He determined the boundaries of Pennsylvania and the line between New York and Massachusetts. From 1779 to 1782 he was professor of astronomy in the University of Pennsylvania and afterward trustee and vice-provost. In 1792 he was made director of the United States mint by President Washington. After three years he resigned and returned to scientific work. He succeeded Franklin as president of the American Philosophical Society in 1790.

His publications (about 20) appeared in the *Transactions of the American Philosophical Society*. The most popular was an ‘Oration on Astronomy.’ An interesting ‘Eulogium’ was delivered after his death by Dr. Benjamin Rush. His life was written by his nephew, William Barton, in 1813, and by James Renwick in Sparks' ‘American Biography.’ An account of him, by S. W. Pennypacker, was issued in 1882.

**RITTER,** rĭt'tėr, **Frédéric Louis,** American musician and composer: b. Strassburg, Alsace, 22 June 1834; d. Antwerp, Belgium, 6 July 1891. He studied music at Paris with Georges Kastner, taught at the seminary at Fénéstrange, Lorraine, and in 1856 came to America and settled at Cincinnati. There he organized the Cecilia (choral) and Philharmonic (orchestral) societies. Removing to New York in 1861 he became the conductor of the Sacred Harmonic and the Arion Choral societies. The first musical festival of note held in New York was given under his direction in 1867. That year he assumed the duties of the professorship of music at Vassar College, which position he held until his death. He was a prolific composer of vocal solos and choruses, among which were musical settings for several Psalms, ‘O Salutaris,’ an ‘Ave Maria,’ a group of Persian songs and more than 100 German lieder. He also wrote works for orchestra and pianoforte and was the author of ‘A History of Music in the Form of Lectures’ (1870–74); ‘Music in England’ (1883); ‘Music in America’ (1883); ‘Manual of Musical History’ (1886); and ‘Musical Dictation’ (1888).

**RITTER, Heinrich,** German philosopher: b. Zerbst in Anhalt, 21 Nov. 1791; d. Göttingen, 3 Feb. 1869. He studied at Halle, Göttingen and Berlin from 1811 to 1815, and in the last-named year the calling out of the volunteers led him to France. On his return he devoted himself exclusively to philosophy, especially in the department of history, in which he adopted the method and critical views of Schleiermacher. He qualified himself at Berlin as a university teacher, and from 1824 held an extraordinary professorship in that city until he accepted a call to Kiel in 1833. In 1837 he removed to Göttingen, where he continued to occupy the university chair of philosophy till his death. Ritter's best works belong to the history of philosophy, his first in this department being an investigation into the doctrines of Empedocles in Wolf's ‹Literarische Analekten› (1820). His ‹History of Ionian Philosophy› (1821); ‹History of the Pythagorean Philosophy› (1826), and ‹Notes on the Philosophy of the Megarean School› in the Rheinisches Museum, are models of historical investigation on the principles of Schleiermacher. His historical masterpiece is the ‹History of Philosophy› (1829–53), which deals with general history up to the time of Kant. It was supplemented by a ‹Review of the History of German Philosophy from the Time of Kant› (1853).

**RITTER, Henry,** Canadian artist: b. Montreal, 1816; d. Düsseldorf, Germany, 21 Dec. 1853. He studied in Hamburg and Düsseldorf, and spent most of his life abroad. He specialized in subjects of a nautical character and was noted for his excellent coloring and careful finish as well as for originality. At his early death he left unfinished a number of paintings as well as a series of illustrations for Washington Irving's works. Among his works are ‹Offer of Marriage in Normandy› (Leipzig Museum 1842); ‹The Poacher› (1847); ‹Indians Flying Before a Burning Prairie› (Kunsthall, Bremen 1851); ‹Middy's Sermon› (Cologne Museum 1853), etc.

**RITTER, Karl,** German geographer: b. Quedlinburg, Prussia, 7 Aug. 1779; d. Berlin, 29 Sept. 1859. He was educated at Halle and resided for a considerable time at Göttingen in order to avail himself of its library. In 1819 he succeeded Schlosser as professor of history at the Frankfort Gymnasium, and in 1820 became professor extraordinary of geography at the University of Berlin, an office which he held with distinguished reputation for nearly 40 years. With Ritter may be said to have commenced a new epoch in geographical science; and a new department, that of comparative geography, claims him as its founder. His great work is ‹Die Erdkunde im Verhältnisse zur Natur und Geschichte des Menschen› (‹Geography in its Relations to Man's Nature and History›), the first two volumes of which appeared at Berlin in 1817–18. Although it was afterward continued on a more extended plan, yet it was left incomplete, covering only Africa and Asia. It constitutes so far as it extends, 19 volumes (1822–59), a vast repertory of valuable information relative to physical and general geography. Among other productions of Ritter may be mentioned ‹Europa, ein geographisch-historisch-statistiches Gemälde› (‹Europe Delineated Geographically, Historically and Statistically,› 1807), and ‹Die Stupas, oder die architektonischen Denkmäler an der indobaktrischen Königstrasse und die Kolosse von Bamyan› (‹The Stupas, or Architectural Monument on the Indo-Bactrian Highway and the Colossi of Bamyan,› 1838). Consult Gage, W. L., ‹Life of Carl Ritter› (New York 1867); Kramer, G., ‹Carl Ritter: ein Lebensbil› (Halle 1875).

**RITTER, William Emerson,** American zoologist: b. Hampden, Wis., 19 Nov. 1856. He was educated at the universities of California, Harvard and Berlin and at the Stazione Zoologica, Naples, Italy. He has been associated with the faculty of the University of California since 1891, becoming professor of zoology there in 1902. He is director of the Scripps Institution for Biological Research, formerly the San Diego Marine Biological Station, and editor of the zoological publications of the University of California. Author of ‹War, Science and Civilization› (1915).

**RITUAL** (Latin, *ritualis,* pertaining to rites), in ecclesiastical usage a manual containing the forms to be used by the priest in administering the sacraments, namely, the communion (when given outside of the Mass), baptism, absolution, marriage and extreme unction; also in such rites as the churching of women, burial of the dead, blessing articles for religious uses, as water, candles, etc. The Roman Ritual now in universal use in the Latin Church was drawn up by order of Paul V, who (1614) «counseled» all prelates to conform to its prescriptions exactly. But though the Pope only counseled (*hortamur* is the word he employs in the bull *Apostolicæ Sedi*), a decree of the Congregation of Rites (1850) declares that the forms of the *Rituale Romanum* «affect the universal church.» Before the issuance of the bull of Paul V there were various ritual manuals authoritative in different countries or different episcopal jurisdictions. In the Eastern churches generally, as in the Greek Schismatical Church, the Ritual forms part of the general service book, the Euchologion, which corresponds to the Missal, the Pontifical and the Ritual of the Latin Church. The ritual of the Anglican Church is contained in the Prayer Book under the heads «Ministration of Baptism,» «Order of Confirmation,» etc. In general Ritual is a term applied to any form used in continually repeated ceremonials. There have been rituals in the religions of most peoples; and these exist in many forms to-day among highly civilized and primitive races alike. Most of the Indian tribes of the North American continent had very rigid and complicated religious rituals. The term ritual is also used in many secret societies for the ceremonial forms used in receiving candidates into the various degrees of the order.

**RITUAL LAW,** that portion of the law of Moses which prescribes the ceremonies of public religious worship, the manner of making trespass offerings, the procedure for the discovery of leprosy, for the purification of women after childbirth, the discrimination of things clean and unclean, etc. The ritual laws of the Hebrews are contained mostly in the books ‹Exodus,› ‹Leviticus,› ‹Numbers› and ‹Deuteronomy.›

**RITUAL IN MYTHOLOGY.** See MYTHOLOGY.

**RITUALISM,** a term designating the practices of a party in the Church of England and the Episcopalian Church in the United States and elsewhere, in surrounding the public worship with a variety of rites and ceremonies, and in resuscitating certain features and usages of the Catholic Church in pre-Reformation times, such as the use of ornate eucharistic vestments, use of the sign of the cross, belief in the «Real Presence,» prayers for the dead, treating the communion service as a real sacrifice, auricular confession and many other beliefs and practices usually esteemed by Protestants as the insignia of «Romanism.» By many, Ritualism is held to be only another name for Puseyism and Tractarianism; but Dr. Pusey, the reputed father of Puseyism, never adopted any of the practices of Ritualism. The Ritualists defend their position against the charge that it is nothing but a revival of «Romanism» in the Protestant Church and that it is flagrantly inconsistent with the simplicity of Christian worship as portrayed in the books of the New Testament, by saying that not all authoritative regulation of ritual is laid down in the New Testament, and that what is obligatory in ritual is to be learned from apostolic tradition. They allege, in explanation of the simplicity of primitive Christian worship, the secrecy and restraint to which the church was subjected through the ages of the persecution. All through that time the apostolic tradition was preserved by the church. On the accession of Constantine the ritual of the church assumed its natural beauty and proportions. They cite the Anglican Book of Common Prayer in its original form as promulgated in the second year of Edward VI (1549) as authorizing most of the practices now condemned by Protestants as ritualistic and «Romanish.» They contend that the Episcopalian Church of England, with its daughter churches, is historically committed to the practices for which the Ritualists are censured. The following are some of the rites and usages which distinguish the Ritualists from the mass of Protestants whether in the Episcopalian or other churches. The Ritualists hold that the «altar» is a necessary part of Christian worship. The Book of Common Prayer, in the «order for the administration of the Lord's Supper,» carefully avoids the word «altar» and says always «table.» The Ritualists revived the practice of auricular confession and set up in their churches confession-boxes as in Roman Catholic churches. They brought back into use the eucharistic vestments — dalmatic, chasuble, cope, etc. The Puritans held the cross an abomination; the Ritualists set it on top of their churches and in the centre of the altar — and not only the cross, but the crucifix. The Ritualists insist on the eucharistic vestments; the position to the east of the celebrant at the altar; the use of unleavened bread, the mixed chalice, altar lights and incense, and they pay formal adoration to the «Real Presence» of Christ's body and blood, believed to underlie the species of bread and wine.

The growth of Ritualism assumed such proportions in England that a commission was appointed by the government in 1867 for the purpose of inquiring «into the rubrics, orders and directions for the regulation of the conduct of public worship.» Seven years later the «Public Worship Regulation Act» was passed for the express purpose of putting down Ritualism; and a judge was appointed to try cases of violation of the ritual. Numerous cases were tried, among the defendants being high dignitaries of the Established Church. Punishments, including imprisonment, followed. But persecution only caused the ritualistic movement to flourish. The Ritualists had the sympathy of many members of the church who were not themselves in favor of Ritualism, for it was very generally felt that it was not wise for the secular court to interfere in things spiritual and to compel priests, clergymen and congregations to refrain from practices which they held to be essential. Practically all the objections against ritualistic practices were sustained by the judges before whom the cases were brought; but this not only failed to drive Ritualism out of the Established Church of England, but it also failed to stop or even retard its growth. The practices have been practically permitted by the legal authorities; so that Ritualism lives to-day strongly entrenched in the Episcopal Church, without fear of successful opposition from any quarter whatever.

The history of Ritualism in the Anglican Church in America is much the same as that of England, except that, on this side of the water, the secular government could take no part in the quarrel, the church on the Western continents being in no way connected with or dependent upon the government. A canon law passed in 1874 at the General Convention instructed the bishops to proceed against any minister «accused of introducing unauthorized ceremonies and practices.» But though the power to discipline the Ritualists rests in the hands of the bishops, it has never been used; and Ritualism to-day attracts little or no attention or comment.

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**RITUALIST,** one who is zealous for strict observance of ritual; in particular, one who advocates the use of the rites of Catholic worship in the Established Church of England or in the Episcopal churches which derive from the Church of England. See RITUALISM.

**RIVALS, The.** Not long after his marriage Sheridan was asked by the manager of Covent Garden Theatre to write a play for that theatre. He set to work with alacrity and finished ‹The Rivals› in six weeks. For this undertaking he was by no means ill-adapted; his father had been an actor and his mother a playwright; and he himself had already on hand notes and sketches for scenes at least if not plays. ‹The Rivals› was produced on 17 Jan. 1775. The play failed, partly because it needed cutting, and partly because of the character of Sir Lucius O'Trigger as it was acted at the initial performance; partly because of its threatened desertion of the sentimental comedy then the fashion. The piece was withdrawn, shortened and Sir Lucius O'Trigger recast. The revival met with a remarkable success, which has lasted to our own day. Many charges of plagiarism were brought against ‘The Rivals’; but the amount of actual literary theft is negligible. The comedy, however, descends from a long line of dramatic ancestors, and can be thoroughly studied from a technical standpoint only in the light of Plautus and Terence and the Greek remains, and of Molière and Congreve, Farquhar, Wycherly and some of the contemporary novels. It is a comedy of manners verging on the exaggeration of farce. The scenes made up of Julia's and Faulkland's high-flown and sentimental love affair have no relation to this authentic comedy and were thrown in by Sheridan as a sop to the prevailing taste of the day; and it is worth noting that when he came to write ‘The School for Scandal’ he made no such concession. Not only the great Joseph Jefferson and every high-school and dramatic society and stock company, but also the frequent quotation of many of the lines, have helped to keep ‘The Rivals’ alive. Every part in the play is actable, the invention of the humorous situations inexhaustible, and the wit and portraiture and motivation cast so happily within the theatrical tradition as to pass unfailingly over any footlights.

Stark Young.

**RIVAROL, Antoine,** äñ-twän rē-vä-rōl, French satirical and political writer: b. Bagnols, 26 June 1753; d. Berlin, 11 April 1801. He was one of the celebrated wits of the 18th century, possessing distinction, elegance and an astonishing facility in the expression of his thoughts that early gave him a position in the salons and at the court of Paris. His first work, which obtained a prize at the Academy of Berlin, was ‘Discours sur l'Universalité de la Langue Française’ (1784). The same year he published a translation of Dante's ‘Inferno.’ Later appeared ‘Lettres à M. Necker’ and in collaboration with Champcenetz, ‘Petit Almanach des grands Hommes’ (1788), a satire on the authors of his day. Becoming an émigré in 1792, he lived at Brussels, London, Hamburg and finally at Berlin, his works at this period being ‘Lettres au Duc de Brunswick’; ‘Lettre à la Noblesse Française’ (1792); ‘Vie politique et privée du Général La Fayette’ (1792); also a preliminary discourse to a French dictionary (1797). In 1828 was published under his name a dictionary of the French language, which was not written by him. His collected works were edited by Chênedollé and Fayolle in 1808.

**RIVAS,** rē'vạs, **Angel Pérez de Saavedra,** 3d Duke of, Spanish statesman and poet: b. Cordova, 19 March 1791; d. Madrid, 22 June 1865. He fought in the Spanish War for Independence, retired from the army in 1815 and in 1820–23 was prominent in the advanced Liberal party. He was secretary of the Cortes in 1821, but at the time of the French invasion of 1823 he was under sentence of death and escaped to England. He later went to Malta, and also lived in Italy and France, engaged in literary pursuits until the amnesty of 1834 permitted his return to Spain. He then succeeded to his brother's ducal title and in 1835 he became Minister of the Interior under Istúriz. Political troubles in 1837 forced him into a second exile, and upon his return in 1843 he allied himself with the Moderate party. He afterward became Prime Minister and served as Ambassador to Paris and Naples. He had early established a reputation as a poet and dramatist and his long sojourns abroad had considerable influence upon his work, both poetry and drama. He was one of the first of the Romantic school of poets in Spain and showed much skill in adapting modern tendencies to the characteristics of Spanish genius. Author of ‘Ensayos poéticas’ (1813); ‘El moro exposito’ (1834); the dramas ‘Slatar’ (1814); ‘Lanuza’ (1822); ‘Álvaro ó La Fuerza del sino’ (1835), etc. His collected works were published (Madrid 1894–1904). Consult Piñeyro, E., ‘El Romanticismo en Espana’ (1904).

**RIVAS,** rē'väs, Nicaragua, a town between Lake Nicaragua and the Pacific Ocean, slightly northwest of the surveyed route of the Nicaragua Canal, and on the high road to Granada. It occupies the site of a Nicaraos Indian village. Pop. 6,000.

**RIVÉ-KING,** rē-va'kĭng, **Julie,** American concert pianist: b. Cincinnati, Ohio, 31 Oct. 1859. She is the daughter of Léon and Caroline Rivé, the latter a musician and her first teacher, and was married in 1878 to F. H. King. She appeared first in concerts at the age of six. Later she was a pupil of Liszt. She has appeared in over 200 concerts with Theodore Thomas and 80 with Seidl, besides in many independent recitals. She ranks among the foremost solo-pianists in America.

**RIVER BOUNDARIES.** See Boundaries of the United States.

**RIVER BRETHREN,** a Christian religious denomination consisting of three communities: (1) «The Brethren in Christ»; (2) «The Old Order» or «Yorker Brethren»; (3) «The United Zion's Children.» The denomination is of Mennonite origin and was founded in Pennsylvania in 1770 by Jacob Engle. He, with his brother John, and 30 Mennonite families, came from Switzerland because of religious persecution and settled in Lancaster County, Pa. After a revival held by the Mennonites, Baptists and Lutherans in 1770, in which various differences in doctrine arose, the Engles and their followers withdrew and formed a body of their own, the name coming either from the fact of its members dwelling near the river or from their performing the act of baptism in the Susquehanna River. They believe in true immersion as the proper form of baptism, observe the ceremony of footwashing in connection with the eucharist, are strict Sabbatarians and hold nonresistance a cardinal virtue. The original order is known as «Brethren in Christ»; «The Yorker Brethren» withdrew in 1843; and «The United Zion's Children» in 1852. The difference in the three bodies is slight. Owing to their members being drafted in the Civil War they sought legal status in 1862 in order to maintain their scruples against resistance. The order has spread from Pennsylvania into Ohio, Indiana, Kansas, New York and Canada. Its members in all bodies number about 5,000.

**RIVER DOLPHINS.** See Porpoise.

**RIVER OF DOUBT.** See Rio Téodore.

**RIVER ENGINEERING. Introduction.**— River engineering is man's effort to create artificial form and behavior in streams for the betterment of his environment. Its purposes relate to transportation, power supply, agriculture, sanitation and security of life and property. River improvement is of present importance to any community according to its susceptibility to devastation by flood or bank cutting, the comparative economy of other means of transportation and power development and its natural agricultural and sanitary advantages. That the utmost in river improvement will eventually become an imperative necessity to continued prosperity and progress of industrial civilization, indeed to the possible perpetuity of such civilization, is attested by every argument for the conservation of natural resources.

**Faults of Natural Streams.**— While most streams are more or less useful to man in their natural states, they generally have characteristics or form or behavior that restrict their usefulness or constitute a menace. Natural low water discharge may fall short of the need for irrigation, power development or sanitary uses and high water discharge may exceed the drainage capacity of natural channels and spread over populated alluvial lands as a destructive flood. Bars and shallow crossings may limit navigation on streams that are otherwise well suited to this use. Alluvial streams habitually undermine and cut away their banks and menace or destroy valuable riparian properties. Streams build up their bottom lands unevenly and the lowest areas may be imperfectly drained and untillable. The regularity of grade that is characteristic of alluvial streams generally denies natural power sites to the regions best suited to human habitation and industrial concentration.

**Origin of Faults of Natural Streams.**— *Low Water.* The mantle of soil and loose rock detritus that generally forms the land surface acts as a reservoir in which part of the rainrall is stored as ground water. During periods of drought this reservoir is gradually drained; the plane below which the ground pores are full of water sinks deeper beneath the surface toward the levels of adjacent streams, the gravitative stress that forces seepage is diminished and consequently the rate of discharge falls off. The most marked falling off in discharge during drought occurs where the soil mantle is thin; the surface is compact; the topography is steep or gullied and precipitation is concentrated as to time.

*Floods.*— Floods vary as to cause and character between two extreme types,— the sporadic type that results purely from excessive local precipitation and the recurrent type that is due to the adjustment of processes of sedimentation to variable discharge.

The type example of the sporadic flood is the sheet flow that forms from cloudbursts. Such floods are virtually built in situ and with small regard for the topography of the affected area. Flow leads to their dissipation rather than to their concentration. Being due to local vagaries of weather, they can be neither forecast nor prevented. The more localized a flood is the more it partakes of the characteristics of the sporadic type.

Recurrent floods are typically developed in large delta-building streams that have variable discharge. Delta growth adds to the length of the channel and tends thereby to reduce the slope and erosional capacity of its lower reaches. The part of the load delivered from upstream that cannot be carried through the lower reaches is deposited. Deposition in the channel reduces its drainage capacity and when that becomes less than maximum discharge overflow is possible. When overflow occurs a part of the load escapes from the channel with the flood waters and accumulates alongside the stream, the coarse materials to form natural levees and the finer to form the more widespread flood plains. A nice adjustment is finally achieved among the delta, channel and flood plain forms that maintains a constant relationship among their different rates of growth. This adjustment keeps the drainage capacity of the lower reaches of the channel less than the higher phases of discharge and so renders the periodic overflow of its flood plains a normal feature of the stream's behavior.

*Shallow Crossings.*— The typical alluvial stream meanders, that is, its course consists of a series of alternating right and left bends. Where the direction of curve changes from one bend to another the channel shallows frequently to an extent that limits the navigability of the stream. Such shallows are called crossings.

The superior depths of the channel on bends is due to centrifugal force incident to the changing direction of the flow. This force affects all moving particles of the stream at right angles with their direction of flow, varying in magnitude with the third power of their velocities. The faster currents of the upper part of the stream are affected more strongly than the slower bottom currents and they are constantly directed toward the outer bank. This movement is compensated by undertow in the opposite direction so that the stream has a torsional or boring motion, as well as downstream flow, on bends. This torsional motion involves a downward migration of faster currents near the outer bank which brings currents capable of scour to greater depths on bends than that at which they are maintained on straight reaches or between bends where no centrifugal force is developed and flow is essentially parallel.

If discharge and load remain constant long enough, the channel depths become adjusted at all points to the relative intensities of centrifugal force and, correlatively, with the curvatures of bends, to give uniform erosional capacity throughout like reaches. When discharge increases, the erosional capacity of a bend increases more rapidly than that of adjacent crossings, and consequently scour occurs on all bends and filling on all crossings during a rise in stage, tending the re-establishment of uniform erosional capacity. When discharge decreases, the erosional capacity of a bend falls off more rapidly than that of the crossings and erosional readjustment involves filling on bends and scour on crossings. Crossing bars are thus built up during flood and are most troublesome to navigation after a sudden drop from a high stage.

*Bank Cutting.*— Bank cutting is also due to centrifugal force incident to changing direction of flow. Currents capable of scour are constantly shifting to the outer banks of bends. The undertow in the opposite direction shifts the bottom load toward the inner bank. Thus the channel tends to shift outward on a bend by taking on load from the outer bank and depositing load along the inner bank.

*Imperfect Drainage.*— Flood plains of an aggrading stream slope downward away from the channel. Their elevation near the channel approximates high water level and in more remote areas may be at or even below the low water level of the adjacent channel. The drainage of the lowest areas, consisting of their own rainfall and the seepage and periodic overflow from the stream, finds its course down the valley parallel with the main stream, to join at some lower point as a distinct tributary. As the main stream is elevated in adjustment to delta growth, the drainage of flood plain areas that are not built up commensurately becomes more and more sluggish and may even become imperfect, to form permanent swamps that are characteristic features of the flood plain of broadly aggrading rivers.

*Regularity of Grades.*—Any unusual declivity in the stream's course makes the channel at that point subject to special erosional attack. This generally causes the elimination of all irregularities of grade early in the geologic life history or cycle of erosion of the stream. In terms of human experience, irregularities of grade suitable to power development are practically permanent, so that the natural processes working toward their elimination are negligible in relation to river engineering.

**Present Methods of River Improvement.** — Low water discharge is increased by storage reservoirs that accumulate water during freshets and discharge it during the natural low water season, supplementing natural ground storage. Floods are prevented from spreading by levees built between the stream and the threatened areas, or from concentrating in trunk channels by detention reservoirs that store temporarily a part of excessive run-off. Shallow crossings are improved by dredging or the stream is forced to deepen itself across them by works that reduce its width. Banks are protected from scour by lining them with resistant material. Imperfect drainage is improved by ditching, diking and pumping. Water-power sites are developed by dams which afford artificial irregularities of grade.

**Limitations of Present Methods of River Improvement.**—Any of these works, if adequately contrived, will eliminate the specific fault to which it is applicable, but a work that does not affect the primary cause of a fault may give but temporary benefit. Works that disturb the natural equilibrium of erosional processes may excite vicious readjustments that end in detriment instead of improvement.

To dredge a navigable channel through a crossing bar is patently a temporary expedient, as it does not eliminate the play of centrifugal force in adjustment to which all crossings build up during flood. Contraction works for increasing crossing depths give a more persistent effect, but their use on all or many crossings impedes flow and causes deposition, adding to the height of levees required to restrain floods.

Levees built to sufficient height accomplish their immediate purpose of preventing the spread of water over the flood plains when discharge exceeds the drainage capacity of the channel. But they also restrain the sediment that would naturally escape from the channel with the flood waters. The retention of flood waters between the levees increases channel discharge above the natural and also erosional capacity. The retention of sediment increases load.

In natural streams crevasse waters commonly return to the channel after depositing their load. Levees, therefore, increase channel discharge locally only by the amount of natural crevasse water in that section of the valley, while load is increased at any point by the amount of sediment that, without levees, would have been vented through all upstream crevasses. The increase in erosional capacity of the channel due to levees varies from place to place but never exceeds a small fraction of the natural. The increase in load due to levees is cumulative down stream and in the lower reaches of a leveed stream it may equal or even be a multiple of the natural load. The readjustments of grade to increased load in the lower reaches involve deposition in and elevation of the channel. Also delta growth and elevation of the channel in adjustment to it are stimulated.

Bank protection by revetment or rip-rap suspends lateral scour. Concomitantly the reassortment of flood-plain materials, which gives a progressively finer grained load and contributes to the gradual decrease in channel slope downstream, is eliminated. Therefore, an abnormal coarse-grained load must be carried through the lower reaches of a stream whose banks are generally protected. The readjustment of slope to this duty involves channel elevation and aggravation of flood heights.

The present methods of channel improvement, flood prevention and bank protection are of limited practicability. The persistence of benefit to navigation from dredging varies inversely with the erosional activity of the stream, and its profitable use is generally limited to lightly loaded streams and waterways where benefit to commerce outweighs a considerable annual expense. Contraction works to improve crossings can be logically used only where it is possible to offset their effects by adding to levee heights. Levees can give permanent protection from floods only where the height required to confine floods after grades become readjusted to all improvement works is within the limit of practical construction. General fixation of banks is permissible only when other factors affecting required levee heights leave a sufficient margin of practical construction for the grade readjustment which they entail.

**The Future of River Improvement.**— To gauge the future of river improvement one must look not to the past history of the art, but to the histories of other arts of early civilization that have assumed the stature of applied sciences. Chemistry, medicine, mining, metallurgy, agriculture — all practical sciences had their early foundations in primitive arts that had developed under pressure of economic need, representing man's physical adaptation to external nature. With the advent of the modern scientific age the spirit of research swept beyond immediate physical need in a wide mental adaptation to external nature; persistent inquiry and experimentation built up pure sciences that became the soil in which the ancient arts grew to fruition in technical practices that are the foundation of modern living.

River engineering dates its inception far back in unwritten antiquity to irrigation and levee projects that are counted among the signs of earliest civilization. Down through all the succeeding ages there was little change in principle or practice for the simple and obvious works first invented were sufficient for the needs of small or isolated projects. When the needs of river improvement were multiplied in the course of industrial development it was natural for the same practices to be extended to larger and more general application without premonition of the more subtle and remote consequences. The first great expansion of river improvement works occurred in Europe in the last half of the 19th century. As it progressed and unexpected results developed it became apparent that the art was still in an experimental stage and that the problems involved not only the study of mobile hydraulic quantities and channel space but also the study of the intricate interrelations of erosional processes and physiographic forms.

This demonstration stimulated research and throughout Europe in the early years of the 20th century hydraulic laboratories were in operation. However, their efforts were mainly directed to local, practical difficulties rather than to general physiographic problems, so their results fell short of the ultimate need — the formulation of methods of unified treatment of entire river systems for complete development of water resources. The work of the European laboratories marks the farthest advance in the direct adaptation of means to necessity in river improvement, for American practice is modeled after the European. It remains to be seen how much this work has been curtailed and set back by the World War.

Entirely distinct from the physical adaptation to external nature represented in European progress in river improvement there has been developed in the last few decades, chiefly by Americans, the science of physiography which treats of topographic forms and the agencies that create them. Its subject matter includes the laws that underlie the agency of running water in the transportation and deposition of solid matter. When these principles are fully invoked to assist in the practical matters of river improvements a new day will have dawned upon the enterprise, a day like that enjoyed by the other arts that have intergrown with science until their basic problems are lifted above the field of speculation and controversy. When river improvement becomes the application of physiographic science, sure progress will be made toward complete and permanent utilization of water resources.

Henry M. Eakin.

**RIVER FALLS,** Wis., city in Pierce County, on the Kinnickinnick River and the Chicago and Northwestern Railroad, about 60 miles west of Eau Claire and about six miles from the Mississippi River. It was settled in 1850 by a colony from New York, incorporated in 1856 and chartered as a city in 1885. It is in a productive agricultural region, in which wheat is the principal crop. The chief manufacturing establishments are flour mills, wagon works and a starch factory. The trade is mostly in grain, flour and vegetables. The principal public buildings are the six churches and the schools. River Falls is the seat of a State normal school and a high school and has two graded schools. The bank has a capital of $25,000. The government is vested in a mayor, elected biennially, and a council of six members elected annually. The city owns and operates the waterworks and the electric-light plant. Pop. (1920) 2,273.

**RIVER-HOG,** one of the African wild swine of the genus *Potamochœrus,* separated from the typical pigs (*Sus*) by the existence of a horny outgrowth from a bony protuberance above the canine in the male. This has been compared by Beddard to the osseous horn-cores of the extinct *Dinocerata.* Five species are recognized, one in Madagascar and the others in South and West Africa. The best known are the gray boschbark or bush-pig (*P. africanus*) of Cape Colony and the red river-hog (*P. porcus*) of the West Coast, remarkable for its vivid rufous coloring and long penciled ears. These pigs lead a half-aquatic life along the marshy borders of sluggish streams and in dense forests, but do great damage to the native plantations in some parts of the country, whence they are constantly killed off. Consult ‹Proceedings,› Zoological Society, London 1894, p. 92.

**RIVER REGULATION.** See Hydraulic Engineering.

**RIVER ROUGE,** roozh, Mich., village in Wayne County, on the Detroit River, five miles south of Detroit, on the Michigan Central and the Detroit and Toledo Shore railroads. Steel works and a shipping yard are located here. Pop. (1920) 9,822.

**RIVER-TERRACE.** See Terrace.

**RIVERA, José Fructuoso,** hō-sā′ frook-too-ō′sō rē-vā′rä, Uruguayan soldier and politician: b. Paysandu, Uruguay, 1790; d. Montevideo, Uruguay, 13 Jan. 1854. He fought in the numerous civil wars, rose to leadership and when Uruguay established her independence became in 1830 first President of the republic. In 1835 he was succeeded by Oribe, and in 1836 headed a revolt against the President, which resulted in a civil war of two years' duration. Oribe was forced to resign, and in 1838–42 Rivera again served as President. In the latter year Oribe, aided by the Buenos Aires dictator, Rosas, invaded Uruguay and in 1843 began the famous nine years' siege of Montevideo. Rivera moved to meet him in the field, but in 1845 was defeated at India Muerta by Urquiza, an ally of Oribe. In 1853 Rivera aided Flores in deposing the recently elected President, Giro, and later became a member of the executive triumvirate.

**RIVERHEAD,** N. Y., village, county-seat of Suffolk County, on the Peconic River, at the head of navigation, and on the Long Island Railroad, 67 miles east of New York. The village was first settled in 1690, and its growth during the first century was slow; in 1729 it was made the county-seat. During the War of

1812 a skirmish between men from some British vessels and the American militia took place near the village and within the limits of the township. It has a variety of industrial establishments, including grist mills, a woolen mill, planing and molding mills, carriage works, soap factories and an organ manufactory. It contains the county courthouse, the agricultural fair buildings and grounds, and has a high school with a school library. Pop. (1920) 5,753.

**RIVERS** (Fr., *rivière;* Span., *ribera;* It., *riviera;* Lat., *riparius,* from *ripa,* bank, of or belonging to a bank), bodies of water of considerable size flowing with perceptible currents in definite channels, and usually without cessation during the year. Some watercourses are designated as rivers, although their beds are dry a part of the year. Rivers, obeying the laws of gravity, seek the lowest level and eventually reach the ocean. The regions having rivers which do not flow into the ocean either directly or indirectly are parts of the earth's surface where the evaporation is so great that no overflow of water results from precipitation. Usually the overflow of a river discharges into another river, and perhaps a second or even a third discharge is made before the waters reach the sea. The Republican River of Nebraska and Kansas flows into the Kansas River in the State of Kansas, and the Kansas River flows into the Missouri, the Missouri into the Mississippi and the Mississippi into the Gulf of Mexico, which last discharges its waters into the Atlantic Ocean through Florida Strait and Yucatan Channel.

**Origin.**— Rivers are usually formed by springs or the gradual melting of the ice and snow which perpetually cover the summits of all the most elevated ranges of mountains upon the globe. Springs and ice are themselves due to the precipitation of water from the atmosphere in the form of snow, rain, mist or dew. These fill the springs, lakes or other reservoirs from which rivers flow by the natural gravitation of water to a low level. The union of various springs, or of these meltings, forms rivulets; these last follow the declivity of the ground and commonly fall at different stages into one great channel called a river, which at last discharges its waters into the sea or some great inland lake. A new-made river at first usually flows over the surface until it has worn itself a channel; or it may follow some depression or deformity in a mountainous region. Rivers are swollen during their course by the rain which falls on the surface. In temperate climates the source of supply tends to greater equality in the volume of the river than in torrid regions, where the evaporation is great. In the former the rains are not only more equally distributed in point of time, but also from a more protracted source of supply; part of the rainfall sinks into the ground and forms springs, part forms rills which flow directly into the river and part feeds those rills with the drainage of the saturated ground long after the rain has ceased. As mountainous regions abound in springs, most rivers begin from a chain of mountains; each side of a chain also has its springs, and the rivers which originate on one side flow in the opposite direction to those which rise on the other. As it is the property of water to follow the most precipitous descent that comes in its way the courses of streams point out the various declivities of the earth's surface, and the line from which large rivers flow in contrary directions generally marks the highest parts of the earth. This line need not, however, be of any great height; in European Russia, for instance, where the rivers are very extensive, the line which separates their sources is very little above the level of the Baltic or of the Black Sea.

**Changes in Form and Size.**—As soon as the stream begins to flow, its channeling and the deepening of its trough commences. If no obstructions prevented, the water would go on enlarging the channel, by widening and deepening. The nature of the soil, the softness or hardness of the rocks along its course, the amount of sediment it carries in its waters and where this sediment is deposited all contribute to change of form and size. The erosive action of rivers on their beds is continually exercised, especially in the early part of their course; where the channel broadens as they approach the sea it may almost cease. Remarkable instances of erosive action are almost everywhere to be observed; but in no case is such action more striking than in the cañons or river-gorges in the Colorado region of the United States. There the rivers have hollowed out for themselves channels that present almost perpendicular rock walls on either side rising to the height of 6,000 feet for hundreds of miles. Such action is also seen where there is a waterfall, in which case the water gradually wears away the rock at the place where the fall occurs and thus causes the latter to recede, as Niagara Falls. In perhaps every case a river has had much to do with the formation of the valley in which it flows. Rivers are very permanent features in the earth's history, and in some cases have hollowed out a channel through a mountain range gradually elevated across their source.

The size of a river depends upon two main circumstances,— the extent and character of its drainage area, and the degree of humidity possessed by the climate of the region from which it draws its supplies,— the latter being often dependent upon prevalent winds blowing from the ocean. The peculiar position of the Andes Mountains with respect to the rest of South America, the fact that by very far the largest proportion of its running waters are drained off in one general direction, toward the Atlantic, and the humidity of the climate, all contribute to the immense size of the rivers. The Andes being placed so near the coast of the Pacific, the rivers which flow into the Pacific Ocean are small, while those which flow on the other side, having such an immense space to traverse, are increased into a vast volume before they reach the Atlantic. The physical conformations of some continents are unfavorable to the accumulation of such vast bodies of water as the rivers of South America. Europe is not of sufficient extent; Africa has a climate which causes rapid evaporation and abounds in sandy deserts. A large part of Asia has not the humidity of the Amazon region, and its vast interior lakes serve as receivers for some of the large streams. The arrangements of its mountains conduce to long and somewhat narrow drainage areas. As the river goes on from year to year, in most cases it cuts a trench below the original constructional channel, and in time forms what is called a consequent valley. By means of the new constructional troughs many of the constructional lakes and the rivers become continuous streams, that increase the length as well as the depth of the channel. Where the waters pass from a hard to a soft rock, or from a resistant to a weak part of the material through which it is channeling, a greater slope is formed making rapids (q.v.) or falls, or cascades (q.v.). The angle of the slope depends upon the difference in the degree of resistance of the hard rock in the old channel as compared with the soft rock in the formation channel. Gradually the channel is cut down close to the sea-level or base-level, and its course is over a gentle, gradual slope. The depth of the channel depends upon the dryness of the climate, softness of the rock, height of the land and the volume of the stream. The dry climate really lessens the volume of the stream, and consequently it cannot force its way with the rapidity of a stream with greater volume even if the widths of the channels are equal. The river flowing through a region of hard rock will cut a deeper valley in a given time than the river of the same size and volume flowing through a region of soft rock; the latter will have a mass of detritus, an accumulation of waste from the weak rock, and it will need a vast volume of water or a steep grade to do the same amount of channeling as the first-mentioned river. Rivers flowing over comparatively low land, with drainage areas not much above the base-level, have shallow channels, as in the southeastern part of the United States, especially in Florida. A river with a large volume of water has more power to carry off sediment, and even where the slope is gentle its momentum is greater than in that of the stream with a small volume of water. There are two causes for the shallow channels of the long rivers of the plains east of the Rocky Mountains — the dryness of the climate and the soft rock material through which they pass.

After a river has cut its channel to the baseline, then its grading really begins, the inequalities gradually disappear, or would disappear if there were no obstructions to the regular work. The constructional lakes and the waterfalls gradually disappear. The constructional lakes may disappear, but if the amount of detritus is large the channels lower down a stream, with a slight grade, may be filled, and thus the water will flow over a bed elevated above what was once its channel. Such channels exist in Ohio and in the plains of Lombardy. Any change in the depression or uplift of the land, whether from volcanic or other causes, will produce some change in the river. In various parts of Europe and the eastern part of North America rivers have changed because of increase of evaporation caused by the continued deforestation of their basins. New tributary rivers appear in the drainage area of a well-defined river. The valleys formed by such streams are called subsequent valleys and the streams themselves are called subsequent streams.

The main stream with all the lateral streams and all tributaries, whether lakes or rivers, is called a river system. The land drained by a river system is called its basin. The system is usually known by the name of the main stream or trunk.

The rate of fall of many of the large rivers is not great. The Amazon has a descent of only 10½ feet in 600 miles of its course — that is, one twenty-seventh part of an inch for every 1,000 feet of that distance. The Loire, in France, between Pouilly and Briare, falls one foot in 7,500 feet, but between Briare and Orleans only one foot in 13,596 feet. Even the rapid Rhine has a descent of no more than four feet in one mile between Schaffhausen and Strassburg, and of two feet between the latter place and the borders of Holland. The glaciers in France show a change in volume and a consequent change in the size and rate of fall of the glacier-fed rivers. See NIAGARA FALLS; WATERFALLS.

**Watersheds or Divides.**— The line which separates the waters which flow into different rivers or different systems is called the watershed or the divide. The continental divide in the United States is the line which parts or separates the streams which flow into the Pacific from those which flow into the Gulf of Mexico through the Mississippi. Divides change from various causes. The subsequent rivers sometimes take the water from one system to another. The gradual removal of a constructional lake may change the divide, as in New York State between the Mohawk River and Lake Ontario; in the Northwest, between the Red River of the North and the Mississippi. The divides in many places are very low, as between the Amazon and Orinoco and the Amazon and the Paraguay. The Orinoco at some distant period reached the basin of the Amazon, and has been subsequently connected with it through what is now an important branch, the Cassiquiare, which after a course of 120 miles from the main river discharges itself into the Rio Negro, a branch of the Amazon; and as the navigable waters of the Amazon approach within three miles to those of the Paraguay there is with only this interruption a continuous communication by navigable rivers from the mouth of the Orinoco, in lat. 9° N., to the mouth of the Paraguay, in lat. 35° S.

**Flood-Plains.**— For various reasons many rivers overflow their banks at annual periods, others at irregular intervals. Such rivers usually carry a large amount of silt which at the time of an overflow is deposited on the land, thus enriching it. Great damage sometimes results from this overflow (see LEVEE; MISSISSIPPI), and various means have been devised to protect the lands adjacent to such rivers from inundation. The flood-plains of the Nile are noted for their fertility; the Mississippi, Amazon, Ganges and many others have extensive flood-plains. The large rivers of Siberia have vast flood-plains caused by the thaws at the sources of the rivers when the lower portions are closed by ice. The descending waters sweep over the frozen surface carrying with them vast quantities of soil, detritus and even forests. The Mackenzie in North America has flood-plains from the same sources as the Siberian rivers.

**Mouths of Rivers.**— The river which enters the ocean may have its channel submerged and the mouth becomes an estuary or a fiord. In either case there is a constant battle for supremacy between the fresh water from the land-mass and the salt waters of the sea. Some of the sediment of the rivers is brought to the sea and either carried out into the ocean or deposited at the mouth of the river, where it forms deltas. In some cases, as the Mississippi, the delta grows rapidly, extends out into the sea and becomes a part of the land-mass. The sediment annually brought down the Mississippi has been estimated as equal to a deposit of a foot in thickness over 12 square miles. The waters of the Ganges and Brahmaputra come more highly charged with sediment on account of their more rapid descent and the more violent rains that fall about their sources, and their deposits exceed many times those of the Mississippi. The sediments are spread out to a distance of 100 miles or more from the land, the waters of the Bay of Bengal being discolored by them even at this great distance. The quantity annually discharged from the mouth of the river has been computed equal to a layer one foot thick over a tract of 225 square miles. The Nile has a vast delta. The Mississippi, Nile, Ganges, Po and many other rivers enter the sea by several channels. The Amazon enters by only one large channel, divided by an island, but the river broadens out into a bay 180 miles wide. The delta-lands are very fertile, and where the river channels have assumed stability, deltas have become valuable additions to the land-mass.

**Economic Relation of Rivers.**— The effect rivers have in supplying moisture to the adjacent lands, either by natural or artificial (irrigation) means, is recognized by all nations. Their uses as contributing to the healthfulness of the climate and to modifications of temperature are well known. In the early history of all the nations on the globe, the waterways were the great thoroughfares which furnished means of intercommunication, and the rivers were largely instrumental in determining the location of the important commercial and industrial centres of the world. The great rivers of Europe and Asia, such as the Rhine, Danube, Volga, Indus, Ganges, Brahmaputra, Yangtse and Ob afford enormous populations access to the sea. The Amazon, with its plain track extending for nearly 3,000 miles, is in many ways less like a river than a fresh inland sea; but the Mississippi and Saint Lawrence, though less extensive, are of greater value for carrying sea traffic to inland places. In their upper valley tracts, rivers are of use chiefly for transporting timber and driving machinery. It is interesting to note that in Switzerland, Norway and Sweden, where there is no coal, there exist exceptional facilities for the use of water power on account of numerous mountain torrents.

### LAW OF RIVERS.

**General.**— In law a body of water having a uniform current is generally termed a river. It consists of the bed, the water and the banks or shores according as the stream is non-tidal or tidal. The law applicable to rivers and their use depends upon the country having jurisdiction over them. In the United States the use of navigable rivers is regulated by the laws of the United States and by the legislatures of the States through which they flow. No general statement that is applicable to all streams, and which governs the use of all streams, can be made, and navigable and unnavigable rivers are not always subject to the same rules. In the United States, in the most approved and important sense of the term, navigable waters include all those having a channel which is useful for commerce. Such waters are public highways by common right. It has been said in construing the common law and in some of the earlier decisions of the courts that by navigable waters are meant all those in which there is a flow or reflow of the tide. This definition may have been proper in England where there is no river of any considerable importance which has not a flow of the tide, but it would be unreasonable, in fact it cannot be applied, in the United States where there are large rivers like the Mississippi, the Ohio, the Allegheny, the Delaware, the Hudson, the Schuylkill, the Missouri, the Columbia and others that are very important for the purposes of navigation, and over which large business interests are transacted. To be navigable rivers, in the legal sense, commerce must be carried on over them which is of a valuable character. It is not necessary, however, that this commerce be carried on by means of boats; waters over which valuable commerce can be carried on are public highways for the purpose, even if they are used only for floating logs and rafts. Most of the authorities in America limit the term navigable waters to waters having an inherent capacity for navigation. Whether a river is navigable or not is generally a conclusion of fact and can be established by proof; but the courts in some States take judicial notice of the fact that some streams are navigable. In common law a distinction was made between waters navigable in law and those navigable in fact; those navigable in law being tide waters. The term is still used in this sense in England. By the civil law, waters that are in fact navigable are such in law, and a navigable river is defined as a *statio itinere navigio* (a place or way for navigation). In the development of American law the tendency of the courts has been toward the adoption of the civil-law doctrines. Among navigable waters are two classes, termed Public and Semi-Public. The basis of classification is ownership. In public waters the soil beneath them is common property. The public have the right of navigation and all rights incident to ownership. Among them are fishing, gathering ice, sea-weed, sand, gravel, etc. All tide waters, including the sea and its arms and tidal rivers, belong to this class, and in many of the States all fresh-water rivers and lakes which have a capacity for valuable floatage are public. The non-tidal waters and the soil under them are private property, although the interest of the owner is qualified by being subject to the right of the public to pass over them.

**Jurisdiction.**— The right of navigation is subject to the control of the government, and the government has the right to improve rivers and harbors. In England this power was vested in Parliament. In the United States the authority of Congress under the commercial clause of the Constitution is paramount. In the absence of Congressional action, the power of the State legislatures is supreme; they may direct the improvements of navigable rivers, and may authorize improvements by individuals and by private corporations, and may levy tolls. Waters which lie within the borders of different States are generally subject to the concurrent jurisdiction of the States. The territory of States and nations when bounded by rivers extends, unless otherwise agreed upon, to the centre of the streams.

**Public Easement of Passage.**— The public have the right of passage over all streams which have a capacity for that purpose, and this includes the right of navigation in boats and vessels, and of floatage as in the case of rafts and logs, and of travel over the ice. In common law the right to navigate waters above the tide was acquired by using the same. Now it may be granted by express act of legislature, but it is generally regarded as an inherent public right needing no legislative sanction. The legislatures of the States having jurisdiction and Congress may make rivers and streams public highways for particular purposes when they are not public highways or navigable for other purposes. For instance, the legislature may make a river a public highway for the purpose of floating logs, although it cannot be navigated by boats or vessels.

**Use of Banks and Shores.**— By the civil law the public have the right to use banks and shores of navigable rivers as appurtenant to the right of passage, and this is true of the States where that system prevails; but under the common law the right to use the shores and banks by navigators was limited to high water mark and the right to pass over the waters does not include the use of banks for general purposes. But the public have the right of anchoring and of mooring on the banks against all except the owners of the banks. There is no public right at common law of towing on the banks. The owners of stranded property may go upon the banks for the purpose of taking it. In the use of rivers for navigation, the boats going down stream have a right to the centre of the stream or the centre of the current, and those going up stream must keep to the sides in passing. A descending boat may keep to the shore, but if she meets an ascending boat hugging the same shore and signaling her intention of keeping the shore, the boat going down stream must keep to the middle of the river. The rule is for the protection of vessels navigating up and down rivers crowded with boats to hold to the centre as nearly as possible. The rule both of statute and the general laws of navigation, which requires steamboats approaching one another to turn to the right, applies to steamboats crossing a river, and ferryboats crossing rivers making frequent trips are obliged to use great care to avoid other sailing craft. Steamboats must keep out of the way of barges and flat boats floating down the river guided only by oars.

**Rivers not Navigable — Rights of owners.** — When a river that is not navigable forms the boundary of property, one-half usually belongs to one proprietor and the other half to the other, the centre of the stream being the line between the owners of the lands on each side, and when the land on both sides belongs to one owner he is then the owner of the whole bed of the stream. This rule of law refers to the land under the water, and it is the property of the riparian owner as much as the banks of the river. The owner of the land has not an absolute ownership of the water, but he can use it for necessary purposes, as for the use of his family and house and to water his stock. If he takes more than the usual quantity and for such purposes as are not necessary, he is liable for damages to riparian owners farther down the stream in case they suffer damages. One owner of the land cannot change the bed of the stream to the injury of other owners; but if the line be changed slowly by accretion at one side, the line of ownership will still follow the centre of the stream. The rule might be different if, for any unforeseen and uncontrollable cause, the stream should burst its banks and make a new channel in a different place.

**Accretions.**— The owner of the land along the side of and under a river has the right to all deposits of alluvium along and upon his land. If an island is formed by accretions in an unnavigable stream, the ownership will be determined by the *filum aquae*, or centre of the stream, and it will belong to the persons owning the land on the side of the line on which it is formed. If the island is on the line, each will own his proportionate share.

**Bridges.**— Congress has power to authorize the erection of bridges over navigable rivers; the power may be exercised and authority given even when the bridges obstruct to a certain extent the free navigation of the rivers. States also have power to authorize the building of bridges over navigable waters within their boundaries, although they may to a certain extent interfere with navigation. This power in the States, however, is subject to the exercise of the power of Congress to regulate navigation. The proposition has come to be recognized as not disputable that, but for the power granted by the Constitution to Congress, the State legislatures would have as full and entire control of the waters of their several States as they have over the land. The States reserve all power not granted to Congress. The sovereignty over the waters of the States vests in Congress and in the several State legislatures. Congress and the State legislatures can provide for the erection and maintenance of draw-bridges over navigable rivers, and provide for the safe passage of vessels in the draws.

**Boundaries.**— When land along the bank of a river is described as being bounded on the bank or shore, instead of the centre of the stream, then low-water mark on the shore will usually be the boundary line. Where land is bounded by a common law navigable stream, that is, one in which the tide ebbs and flows, the boundary is the high-water mark on the shore, and in some States in which there are large rivers that are navigable, although the tide does not ebb and flow, the boundary line is held to be low-water mark. The proprietor has a right, subject to government supervision, to erect wharves and piers extending to low-water mark or into the channel of the stream. In deciding what is low-water mark, the ordinary rise and fall of the water is taken into account. There is not a unanimity of legal opinion in all the States upon the subject of the ownership of the beds of streams.

**Dams.**— The owner of land on both sides of a stream not navigable may erect a dam and swell the water of the stream or form a pond up to the line of the land of the next owner up the stream. An owner of but one bank cannot, without permission, erect a dam beyond the thread of the river. The erection of dams has been encouraged by the legislatures in many of the States on the ground of public policy. The right to erect dams has been given to riparian owners even when they flow the lands above them, and in some cases permission has been given to riparian owners to erect dams across the stream, although they owned land only upon one side. In these cases the statutes authorizing the erection of such dams have provided the method of assessing and collecting damages. Riparian owners on navigable streams, whether navigable by nature, or declared to be public highways by the legislatures of the States through which they flow, cannot erect dams across such streams without permission of the legislature having jurisdiction, or Congress. This permission is granted in some States by general law, and in others, as in New York, by special laws. The legislatures in granting permission to erect dams always provide for ordinary navigation and for the maintenance of fishways. The right given by legislatures and by Congress to erect dams is not a protection against injuries to private owners. Such owners have a right to collect damages.

**Ferries.**—A ferry franchise is a right to transport passengers and property across a stream and to land at a particular place on its bank. In the United States this right is established by legislative authority. It is the creature of a sovereign power and no one can exercise it without the consent of the State. It is within the control of the government. In England the right was granted by the Crown, or founded upon prescription. A ferry franchise is real estate and can be sold like any other real estate.

**Fishing.**— Ordinarily any person may take fish out of navigable streams if he can do so without trespassing upon the lands of private owners. In most of the States of the United States as at common law, the exclusive right to fish is in the owners of the banks of rivers that are not navigable unless otherwise appropriated by statute. This right, however, is subject to legislative control. The preservation of fish in the waters of a State is of such public concern as to fall within the domain of legislative power. No owners of land have the right to obstruct the free passage of fish up and down the streams. The legislatures have the right to regulate the taking of fish from private rivers, which are unquestionably private property.

**Floods.**— Riparian owners who collect water on their land must keep such water under control at their peril, and dams erected for the purpose of confining water or creating ponds must be constructed with such care and skill as to make them capable of resisting usual and ordinary floods.

**Ice.**— Water congealed is ice. Ice formed upon private waters, and that includes rivers owned by individuals, is real estate and is the property of the owner of the soil over which it is formed. In some of the States, however, as in Michigan, it is held as personal property and can be sold as personal property. After it is cut and removed it is always personal property. The owners of land bordering upon navigable streams in States where they are held to be public property, have no title to the ice which forms on such streams; such ice belongs to the first person who appropriates it, but generally ice forming upon private freshwater streams belongs exclusively to the riparian proprietors and they may prevent others from removing it and maintain trespass against those who cut it without permission.

**Irrigation.**— The right to take water from streams passing over land owned by individuals is regulated by law, and differs in different States. The right, however, is generally recognized that there may be a reasonable appropriation, but no total diversion of the water.

When the State or the government intervenes and takes control of rivers for the purposes of irrigation, then the streams are to be used according to the laws enacted for the purpose. This is so as to the use of all rivers that can be used for the general good of the public. The courts have jurisdiction over questions arising out of the use of rivers. The United States admiralty courts have jurisdiction over causes of action arising in the large rivers as they do in the Great Lakes and the sea and coast waters.

**Bibliography.**— Lawson, ‘Geography of River Systems’; Napier, ‘Lakes and Rivers’; Ruffner, ‘Non-Tidal Rivers of the United States’; Russel, ‘Rivers of North America’; Wheeler, ‘Tidal Rivers’; Morrill, ‘Floods of the Mississippi River’; Edward, ‘Thousand Miles up the Nile’; Keller, ‘Amazon and Madeira Rivers.’

**RIVERSIDE**, Cal., city and county-seat of Riverside County, on the Santa Fe, Southern Pacific, Salt Lake and Pacific Electric railroads, about 60 miles east of Los Angeles. It was founded in 1870 by settlers largely from the New England States and New York, and was incorporated as a city in 1886.

Riverside is famous as one of the largest citrus producing and shipping points in the world, the annual output of the citrus fruits in Riverside County being over 6,000 cars, of which something over 1,000 cars are lemons, the balance being oranges. There are over 20 packing-houses in the city where oranges and lemons are shipped, employing over 1,000 persons at the height of the season. Alfalfa and deciduous fruits are also successfully grown, and there is a large grain-producing area in the county. There are three large fruit canneries in the city. Cotton is extensively grown in the Palo Verde Valley in Riverside County and the only place in the United States where dates are grown in a commercial way is in the Coachella Valley in Riverside County.

Riverside has one of the most extensive and complete irrigation systems in southern California. The climate is remarkably healthful and the place is famous as a health resort. The architecture of the public buildings has been largely developed along Mission lines, and among the famous buildings of this character are the Glenwood Mission Inn, the Carnegie library and the Girls' High School building. The courthouse is a single-story structure built along classic lines, and cost $250,000. Riverside is the seat of Sherman Institute, a United States Indian School, which has over 600 pupils, and of March field, an army aviation post.

There are four banks with deposits of over $7,000,000. The government of the city is vested in a mayor and city council of six members. Pop. 20,000.

**RIVES,** rēvz, **Alfred Landon,** American engineer, son of William Cabell Rives (q.v.) and father of Amélie Rives: b. Paris, France, 25 March 1830; d. 1903. He was educated at the University of Virginia and at the École des Ponts et Chaussées, Paris, where he was graduated in 1854. He was assistant engineer in completing the capitol at Washington, was engaged on the aqueduct there, and later was in charge of the United States survey for improving the Potomac River. He was colonel of engineers in the Confederate army during the Civil War, and was afterward manager of various railways and engineering enterprises.

**RIVES, Amélie.** See TROUBETZKOY, A. R.

**RIVES, George Lockhart,** American lawyer and historian: b. New York, 1 May 1849; d. 18 Aug. 1917. He was educated at Columbia University and Trinity College, Cambridge, England; and was admitted to the bar of New York in 1874. He engaged in practice in New York, and in 1887–89 was Assistant Secretary of State in the Cleveland administration. He was president of the commission to revise the Greater New York Charter in 1900; was a trustee of Columbia University from 1882 and a trustee of the New York Public Library after 1895, serving as president of the board from 1914. 'Author of 'The United States and Mexico, 1821–48' (2 vols. 1913).

**RIVES-WHEELER, Hallie Erminie,** American novelist: b. Christian County, Ky., 2 May 1876. She has published 'Smoking Flax' (1896); 'As the Hart Panteth' (1896); 'A Furnace of Earth' (1900); 'Hearts Courageous' (1902); 'The Castaway' (1904); 'Satan Sanderson' (1907); 'The Kingdom of Slender Swords' (1909); 'The Valiants of Virginia' (1912); 'The Long Lane's Turning' (1916).

**RIVES, William Cabell,** American legislator and diplomat: b. Nelson County, Va., 4 May 1793; d. near Charlottesville, Va., 26 April 1868. He was educated at Hampden-Sidney and William and Mary colleges, studied law, and in 1816 was a member of the Virginia constitutional convention. In 1817–19 and in 1822 he served in the State legislature, and in 1823–29 was a member of Congress. He was Minister to France in 1829–32, and in that capacity negotiated the treaty indemnity in 1831. He served in the United States Senate in 1832–34, 1835–45, and in 1849–53 was again Minister to France. He was a member of the peace conference at Washington in 1861, and after the secession of the South sat in the Provisional Congress at Montgomery, Ala. He published 'Life and Times of James Madison' (1859–69); 'The Life and Character of John Hampden' (1845); 'Ethics of Christianity' (1855).

**RIVETING MACHINES.** See METAL WORKING MACHINERY.

**RIVIERA,** rē-vē-ā'rä, a district bordering the Mediterranean Coast, partly in France, partly in Italy, with Genoa as its central point. It extends to Spezzia on the east and Nice on the west, and is a favorite winter resort of invalids and others. The whole coast is traversed by a road and by a railway.

**RIVIÈRE,** rē-vē-ār', **Briton,** English artist: b. London, 14 Aug. 1840; d. there, 20 April 1920. He studied art under his father, a drawing master, worked at illustrating for many English and American publications and exhibited at the Royal Academy for the first time in 1858. He was elected A. R. A. in 1878 and R. A. in 1881. Among his most notable pictures, many of which have been engraved, are 'Strayed from the Flock'; 'The Lost Sheep'; 'Legend of Saint Patrick'; 'An Anxious Moment'; 'Circe'; 'Giants at Play'; 'Actæon'; 'Væ Victis'; 'Rizpah'; 'A Fool and His Folly'; 'Daniel' (1872); 'Sympathy' (1878), and 'Miracle of the Gadarene Swine' (1883), which are found in the Tate Gallery; 'Persepolis' (1878), considered his masterpiece; 'In Manus Tuas Domine' (1879); 'A Mighty Hunter before the Lord' (1891); 'Beyond Man's Footsteps' (1894, also in the Tate Gallery); 'Hark, Hark, the Lark' (1909). He is also known as a sculptor by his 'Anatomical Lion' (1888); 'A Dying King' (a lion, 1894), and 'The Last Arrow' (a lion-hunting scene, 1896).

**RIVIÈRE DU LOUP,** rē-vē-ār dü loo. See LOUISEVILLE.

**RIVINGTON, James,** American printer: b. London, about 1724; d. New York, 4 July 1802. Early in life he was a bookseller in London, but in 1760 came to America and opened a shop in Philadelphia, then in 1761 established himself in New York, and on 22 April 1773 began the publication of a newspaper entitled the *New York Gazetteer, or the Connecticut, New Jersey, Hudson River and Quebec Advertiser.* It was Royalist in sympathies and circulated among the Tories and gave to its publisher a position of some prominence. His affairs seem to have been under investigation by both the Provincial and Continental Congresses, and he himself was placed in temporary confinement. In November 1775, in consequence of his constant assaults upon the patriots, and especially Captain Sears, that officer came from Connecticut with a company of horsemen, proceeded to Rivington's printing office, destroyed the press and converted the types into bullets. Rivington then went to England, and being appointed king's printer in New York, returned with a new press after the city had fallen into the hands of the British, and in October 1777 resumed the publication of his paper under the old title, soon changed to *Rivington's New York Loyal Gazette,* and on 13 December to the *Royal Gazette.* About 1781, when the success of the British was becoming very doubtful, he played the part of a spy, furnishing Washington with important information. When, therefore, New York was evacuated Rivington remained in the city and changed the title of his paper to *Rivington's New York Gazette and Universal Advertiser.* The paper finally suspended publication in 1783, and he passed the remainder of his life in comparative poverty.

**RIVOIRE,** rē'vwär', **André,** French poet and playwright: b. Vienne, Isère, 1872. He was educated at the Lycée Henri IV, became a collaborator on *La Revue de Paris* and was elected a Chevalier of the Legion of Honor. He occupies a foremost place among the younger French poets and has been equally successful as a dramatist. Author of 'Les vierges' (1895); 'Le songe d'amour' (1900); 'Le chemin de l'oubli' (1904); and the dramas 'La peur de souffrir' (1899); 'Il était une bergère' (1905); 'Le bon roi Dagobert'

(1908); ‹Mon ami Teddy› (1910); ‹The Little Shepherdess› (1915); ‹L'humble offrande› (1916), etc.

**RIX, Julian,** American painter: b. Peacham, Vt., 1850; d. New York, 24 Nov. 1903. He used to say that he was «a pupil of nature,» and appears to have had no regular academic training. He came to New York in 1888, and his work immediately attracted attention by its marked personal qualities. His California landscapes have been familiar ever since to all visitors to the exhibitions. His best paintings, among which are scenes in the Maine woods, were produced during the last five years of his life. Among those found in private collections in New York, Rochester and Baltimore, are ‹Sunset, California Coast›; ‹High Tide, Coast of Maine›; ‹The Woodland Spring, Mike Marr's Camp, Moosehead, Maine›; ‹Breezy Afternoon›; ‹Solitude›; ‹Old Oaks›; ‹Twin Oaks›; ‹Noon-day›; ‹A Breezy Day›; ‹St. John Harbor.›

**RIX DOLLAR,** the English way of writing the names of different silver coins used in various European countries, as the *rigsdaler* of Denmark = 53 cents; the Swedish *riksdaler* = 27 cents.

**RIZAL, José,** hō-sā' rē-thäl', **Filipino** patriot and author: b. Calamba, province of La Laguna, Luzon; d. Manila, 30 Dec. 1896. He studied medicine at Manila, and was graduated from the University of Madrid as doctor in medicine and philosophy; studied further in Paris, Heidelberg, Leipzig and Berlin; made researches in philology and ethnology; and was elected a member of the Berlin Anthropological Society. Having returned to the Philippines, he was soon compelled to emigrate, owing to the hatred visited upon him by the old Spanish party on account of his story, ‹Noli Me Tangere,› descriptive of political conditions in the Philippines. He then resided in Japan, North America and London, where he prepared an edition of Morga's ‹Sucesos de las Islas Filipinas,› originally printed in Mexico in 1609. On the continent he wrote another political novel, ‹El Filibusterismo.› Subsequently he practised medicine at Hong-kong and went to North Borneo, where he purposed to establish an agricultural colony of Filipinos. Though he had obtained permission to visit the Philippines, he was arrested on arrival there, and banished to Dopitan. On the outbreak of the native insurrection against Spain, he was accused of being its instigator; and on a third trial was condemned and shot. The proceedings against him have been described as farcical. He was undoubtedly the most talented Filipino of recent times.

**RIZAL,** Philippines, a province of the island of Luzon, formed by the consolidation of the former province of Manila (excepting the city of Manila) and the district of Morong, bounded on the east by the province of Infanta and the Bay Lagoon, and on the west by the Bay of Manila; area, 1,026 square miles. The surface, except that part of the former province of Manila which lies south of the Pasig River (q.v.), is mountainous, traversed by a number of short irregular ranges. There are many plains which, though fertile, are often inundated by the Bay Lagoon to the destruction of crops. In the western part of the province, the betel is grown extensively, especially in the vicinity of the town of Pasay; other products of the province are rice, sugar, corn and tobacco; there are also extensive forests. A fine variety of building stone is quarried on the island of Talim, in the Bay Lagoon. The industries other than agriculture include lumbering, fishing and the manufacture of lime, mats and clothing for native wear. The trade of the province naturally concentrates at the city of Manila, and the railroad from Manila to Dagupan, numerous roads and the waters of the Bay Lagoon and the Pasig River provide means of communication between the different parts of Rizal and Manila. The province was created and civil government instituted in June 1901. Pop. 246,940.

**RIZZIO, David.** See Riccio, David.

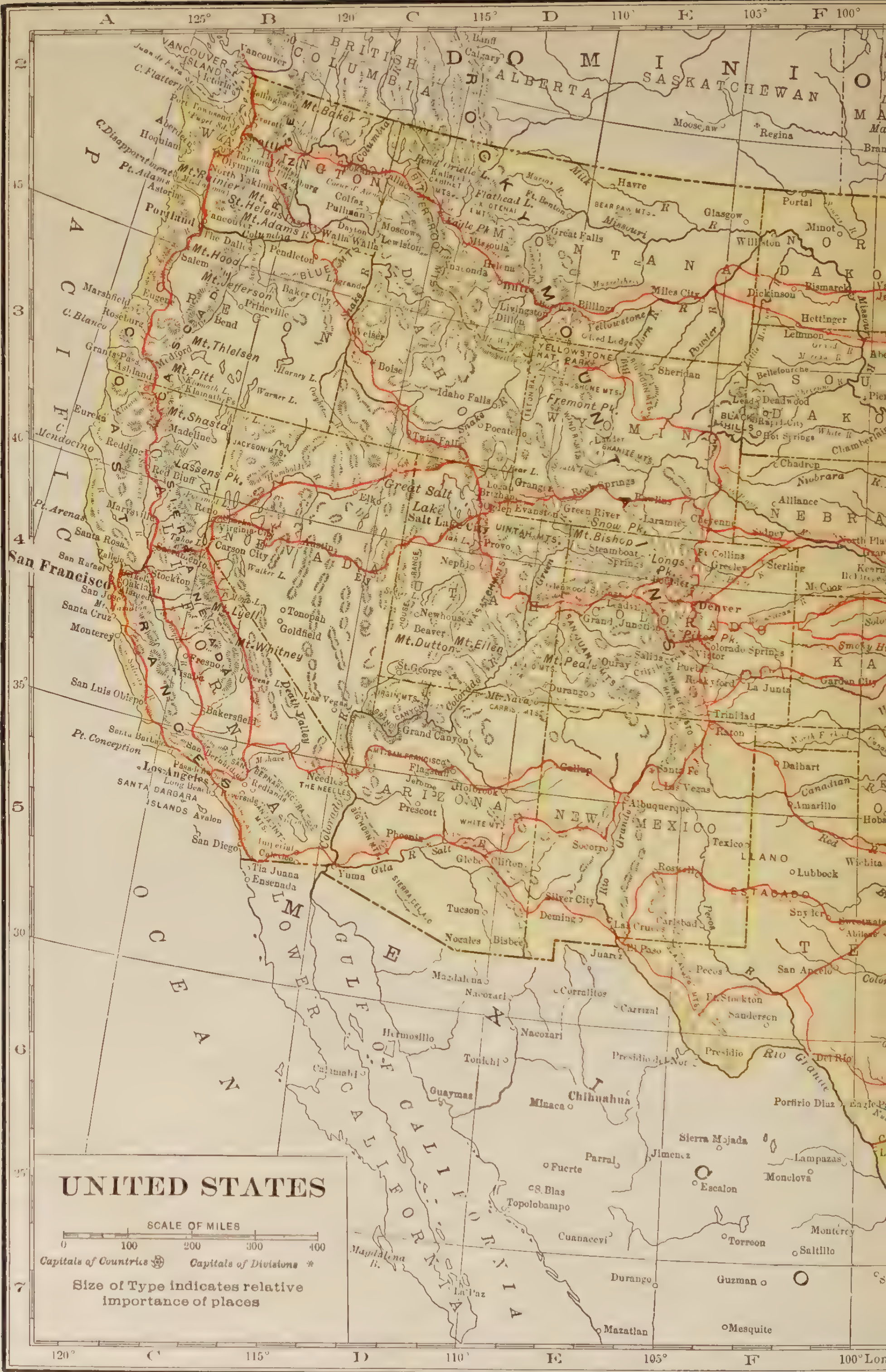
**RIZZO, Antonio.** See Riccio, Antonio.

**ROACH,** rōch, **John,** American shipbuilder: b. Mitchelstown, Ireland, 1815; d. New York, 10 Jan. 1887. He came to this country in 1829, obtained employment in various iron works and foundries, became a machinist and finally erected a foundry of his own. Later he established the Ætna Iron Works, where he constructed the first compound engines built in the United States, and also built the largest engines which had been made in the country at that time. In 1871 he purchased the Rainer shipyards at Chester, Pa., enlarged the establishment until its value was estimated at $2,000,000, and under the name of the Delaware River Iron Shipbuilding and Engine Works, of which he was entire owner, built a large number of merchantmen and also constructed the first ships for the new United States navy, among them the cruisers *Atlanta, Boston* and *Chicago,* and the despatch-boat *Dolphin.*

**ROACH,** a small European fresh-water fish (*Leuciscus rutila*), of the family *Cyprindæ*, related to the dace, chub, etc., and a favorite of anglers, because so much skill is needed in hooking it. It rarely weighs more than a pound, and is grayish or bluish green on the upper parts, lightening into lustrous white on the abdomen.

**ROACH,** an insect. See Cockroach.

**ROAD-RUNNER,** one of the English names of a species of ground-cuckoo (*Geococcyx californianus*), so called from the chaparral or somb, which it inhabits. A remarkable bird which Coues aptly describes as a «cuckoo compounded of a chicken and a magpie,» having a length of about two feet, of which a half is tail, very short wings, powerful legs, and feet of the cuckoo type, a rather long bill and crested head. The colors are changing and varied bronzes, dark steel blue on the head; everywhere except on the rump streaked with white and tawny; underparts soiled whitish, streaked with black on the throat, breast and sides. The chaparral-cock inhabits northern Mexico and southwestern United States, while a second related species is confined to Mexico. When pursued it seldom flies, but runs with great speed with upraised wings. Like other American cuckoos it builds a flimsy nest of twigs, in which six or more white eggs are laid at intervals. In feeding both animal and vegetable matter are partaken of. They are sometimes domesti-



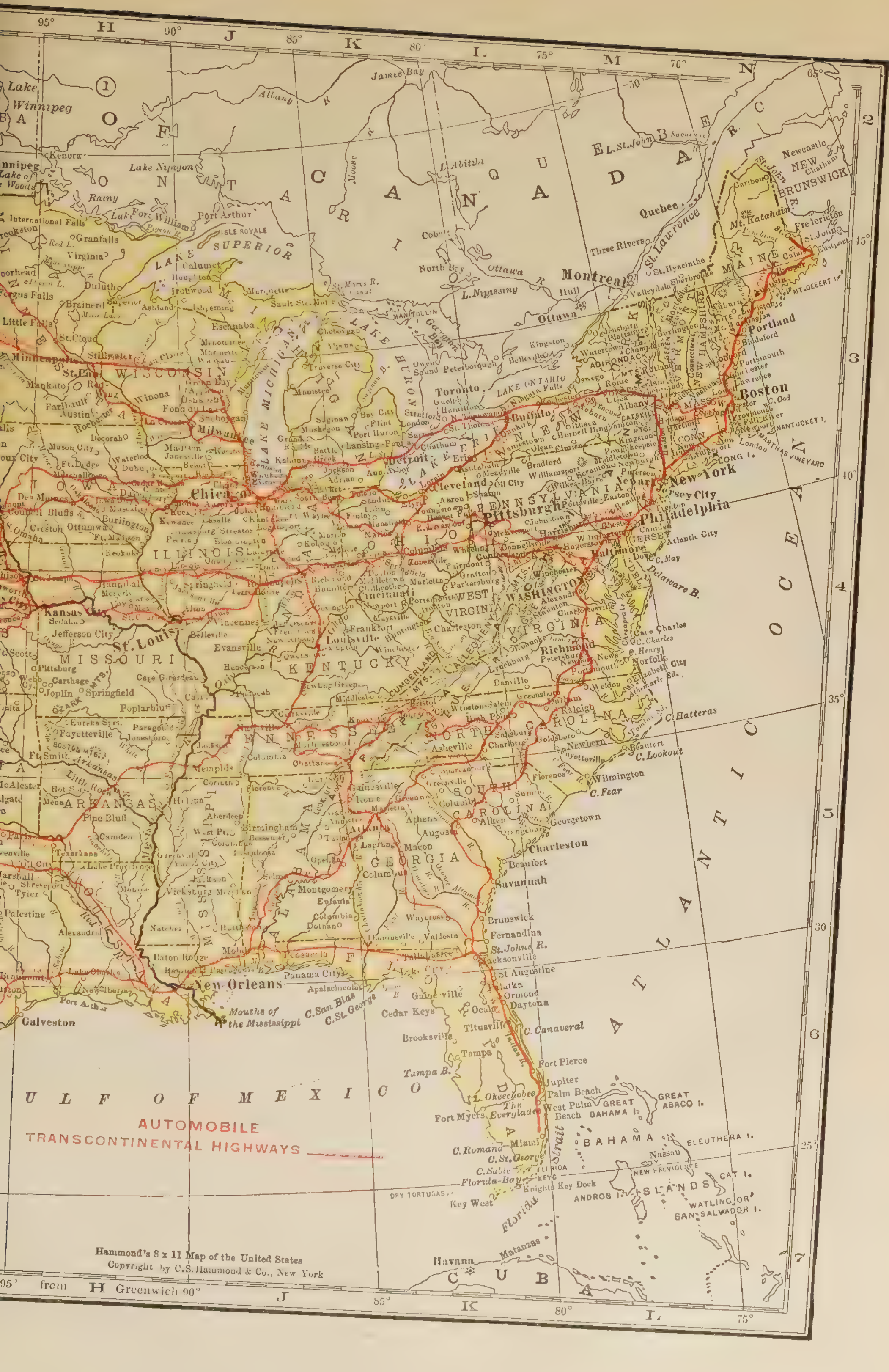
# UNITED STATES

SCALE OF MILES

0 100 200 300 400

*Capitals of Countries* ✪ *Capitals of Divisions* *

Size of Type indicates relative importance of places



Hammond's 8 x 11 Map of the United States
Copyright by C.S. Hammond & Co., New York

cated and trained to catch mice and other house pests. Other names applied to this bird are road-runner, ground-cuckoo, paisano and snake-killer, each of which suggests one of the peculiarities of the bird. See CUCKOO.

**ROADS AND HIGHWAYS. Historical Review.**— Road building requires community action of a fairly high order. Savage man built no roads nor had he any conscious need for them. His wants were few and of an individual character. Gradually, however, as he mounted the ladder of civilization his wants increased both individually and collectively. The game trail and natural path became inadequate for travel, commerce and the movement and supply of armed forces.

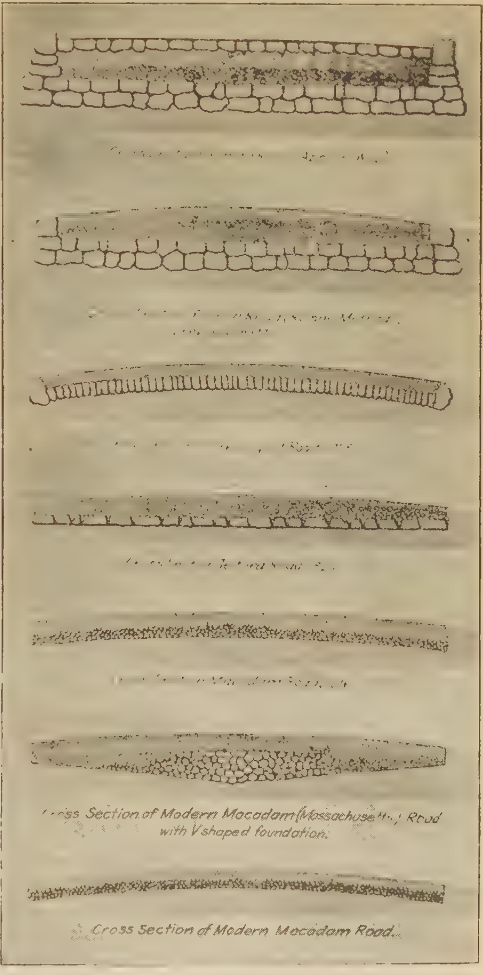
When and where man first began to build roads we do not know. That it was long before the beginning of authentic history is certain. Dense populations and large cities are impossible without roads. Furthermore the construction of such works as the pyramids of Egypt and the «great walls and hanging gardens» of Babylon could not have been accomplished without the existence of roads for the transportation of materials and supplies.

The Building of the Roman Roads (allegorical engraving from an old print).

Herodotus tells us that in Egypt a «Great King» built a magnificent road across the sands for the transportation of the materials for the «Great Pyramid,» employing for this purpose 100,000 men for a period of 10 years. This road, 10 feet thick in places, was built of massive stone blocks and lined on both sides with mausoleums, temples and statues. Traces of what may be a part of this road are found near the «Great Pyramid,» probably the oldest authentic remains of a road surfaced with stone. Early historians speak of wonderful roads radiating from Babylon on or before 2000 B.C. These roads extended to Susa, Ecbatana, Sardis and Nineveh. Strabo even speaks of the road between Babylon and Nineveh as being paved with brick laid in a mortar of asphaltum.

The ancient Persians, Assyrians, Carthaginians, Chinese and Peruvians were all great road builders. Their works, however, have all passed into decay and the records of their achievements lost or largely forgotten.

The Romans are the first systematic road builders of which we have definite knowledge.


Cross Section of Modern Macadam (Massachusetts) Road with V shaped foundation.
Cross Section of Modern Macadam Road.

Evolution of Road Construction.

The first of the great Roman roads, generally known as the «Appian Way» or «Queen of Roads,» was begun by Claudius Appius about 312 B.C., and led from Rome to Capua, a distance of 142 Italian miles. This road was later extended to Brundisium (Brindisi), a total distance of 360 miles, and was probably finally completed by Julius Cæsar. The «Flaminian Way,» the second of the great Roman roads, was begun about 220 B.C. This road crossed the river Nar about 60 miles from Rome by means of a great stone-arch bridge with a central span of 150 feet and a rise of 100 feet. After the completion of the «Flaminian Way» road building progressed very rapidly so that when Rome reached the height of her glory no less than 29 great roads radiated from her gates. Every conquered province was soon traversed with connecting roads and the entire Roman road system of main or military roads is estimated to have amounted to 50,000 miles.

The construction of the main Roman roads was extremely massive, consisting of four courses having a total thickness of about three feet and generally a width of from 16 to 32 feet or more. The foundation course of *statumen* was composed of large flat stones bedded in mortar. On this foundation was placed the *rudus,* a layer of hand rock laid in a form of lime or cement mortar. The *nucleus* consisted of small stones, gravel or pieces of brick and broken tile, laid in mortar. On top of this was placed the *summa crusta,* or wearing surface, of large, flat, closely-joined stones, making the total depth of the road about three feet.

The highway legislation of the Romans forms the basis for many of our present road laws. By the Roman law the right of the use of the roads was inherent in the public. The roads could be the property of no one, while the emperors or other chief magistrates were their conservators. The majority of the great highways were built by contract at the public expense. A few, however, were built, at least in part, from the spoils of war, the private munificence of emperors or great personages ambitious for public approval and acclaim. Their maintenance was in part by the labor of soldiers and slaves, or by enforced labor, which sometimes took the form of taxation. But, in whatever form the maintenance was made, it was at the expense of the district through which the road passed. The local or vicinal roads were committed to the charge of the local magistrate and as a rule maintained by compulsory labor or the contributions of the whole neighborhood.

In England, following the old Roman law, the «King's Highway» early came to represent a perpetual legal and customary right of passage, residing in the sovereign, for himself and his subjects over another's land. The maintenance of the road at first devolved on the Lord of the Manor, then for many centuries on the parish and now on the district and county councils. In the United States the public road has come to represent a definite strip or area of land owned and maintained by the public for public passage and such additional uses as may be determined by statute.

With the fall of the Roman Empire its magnificent system of roads began to decay and as a result of the following thousand years of neglect ceased to exist. Not until about the close of the Middle Ages did road building begin to revive and then not in Italy but in England and France. In 1597 Sully was appointed «Grand Voyer» of France and slow but definite improvement of the roads was begun. Broken stone began to be used extensively for surfacing during his Ministry.

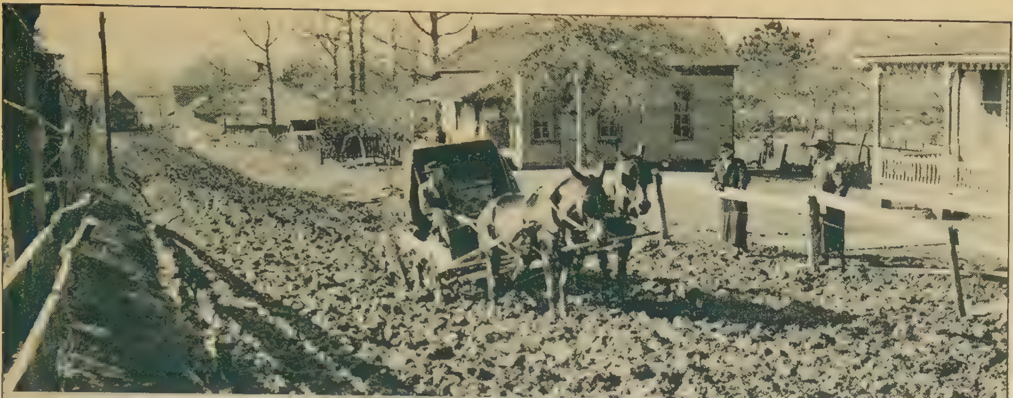
In 1661 when Colbert became Comptroller of Finance he extended the feudal system of compulsory labor called the «corvee» so as to compel every able-bodied rural peasant, together with his work animals, to labor on the road or in the production of road materials as many days as the king, at the request of his Comptroller, might decree. By this means 15,000 miles of main roads were surfaced with broken stone. This work, however, imposed a fearful hardship on the peasants and was accompanied by the gravest abuses and caused the greatest discontent. Nevertheless the system of the «corvee» was continued with the greatest rigor until 1774 and was not entirely abolished until 1787.

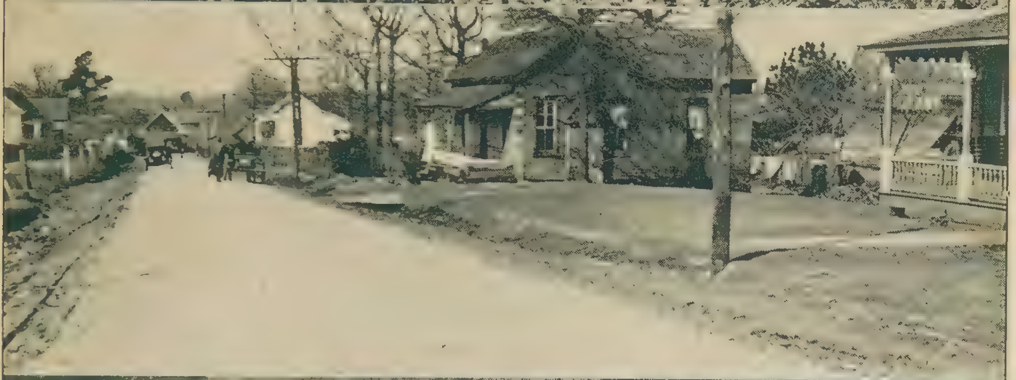
About 1775 Tresaguet introduced in the department of Limoges a system of road building and maintenance which soon became general in France. This system, by making scientific provision for proper drainage, greatly reduced the amount of material required and substituted for the old periodical, haphazard road mending by the inefficient compulsory labor of the «corvee» continuous, systematic maintenance by permanently employed laborers employed by the state or departments and under the supervision of skilled engineers. This system, with but slight modifications is still in force. The state department of roads and bridges (*Corps des Ponts et Chaussées*) which has full control of all state highways is and has been for nearly a century and a half the chief controlling force in all road matters in France.

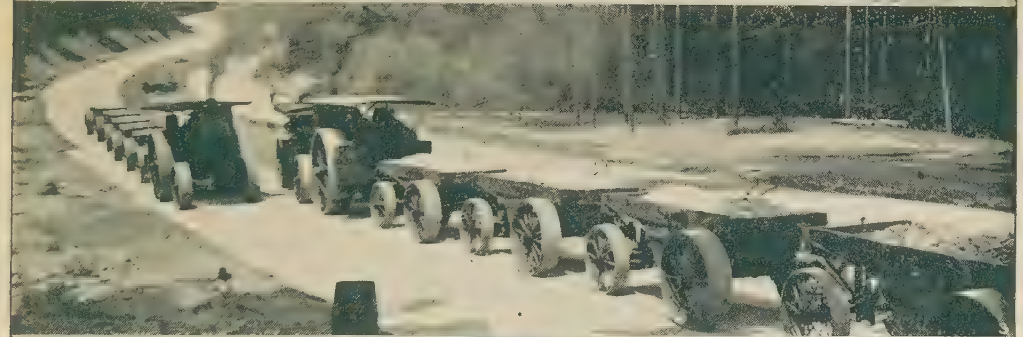
In England, until near the close of the 13th century, the duty of maintaining the King's Highway devolved entirely on the Lord of the Manor. From 1285 until 1555, however, we find a gradually increasing trend toward placing this burden on the parish. In 1555 the duty of road maintenance was by statute definitely placed on the parish and for the next 300 years Parliament was often obliged to devise new ways and means to enforce this obligation.

As travel and trade increased, the demand for improved roads became more and more insistent, and finally the argument that, «Every person ought to contribute to the roads in proportion to the use he makes or the benefit he derives from them,» found favor with Parliament and the toll-road era began. The toll-road or turnpike consisted of a grant or franchise by Parliament to a company to improve and maintain a certain length of road and establish toll gates and collect certain fixed tolls for each passage over the road. These charters were usually granted by Parliament for a term of 21 to 31 years, and, during the early period of toll-road existence, were usually renewed without question. The first turnpike act by Parliament was passed in 1663 and during the later part of the 18th century the toll roads multiplied very rapidly. Not less than 1,100 such trusts or companies, involving about 20,000 miles, existed in 1838 when the railroad began to make itself felt in diverting the large coaching traffic. The toll road, however, never became popular with the public. The inherent fault was the impossibility of fixing a rate of toll which would be accepted as fair by all. Many of the turnpike trusts, also, proved financially unprofitable, due largely to the high cost of collecting the tolls. In 1878 England provided that no further charters should be granted and that as the existing charters expired the toll roads should be taken over by

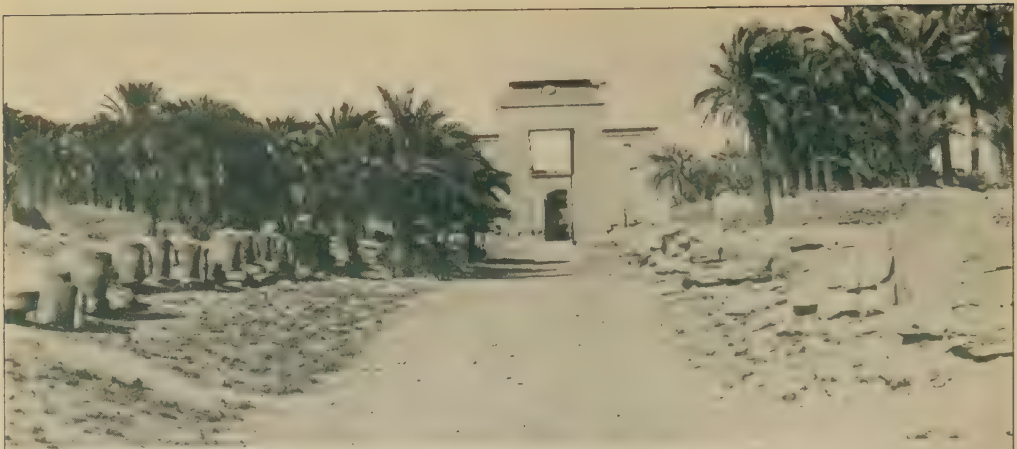
# ROADS AND HIGHWAYS

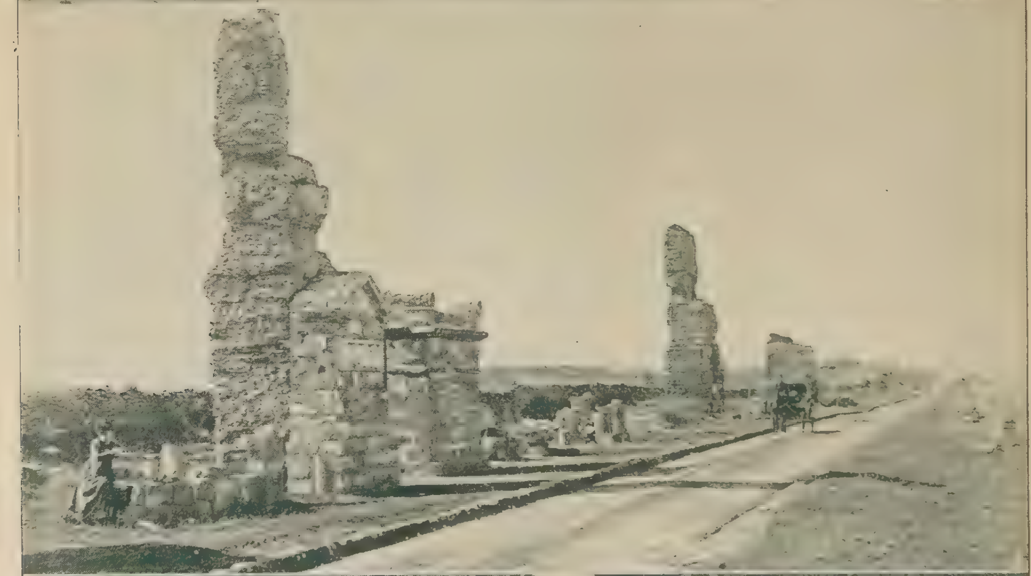


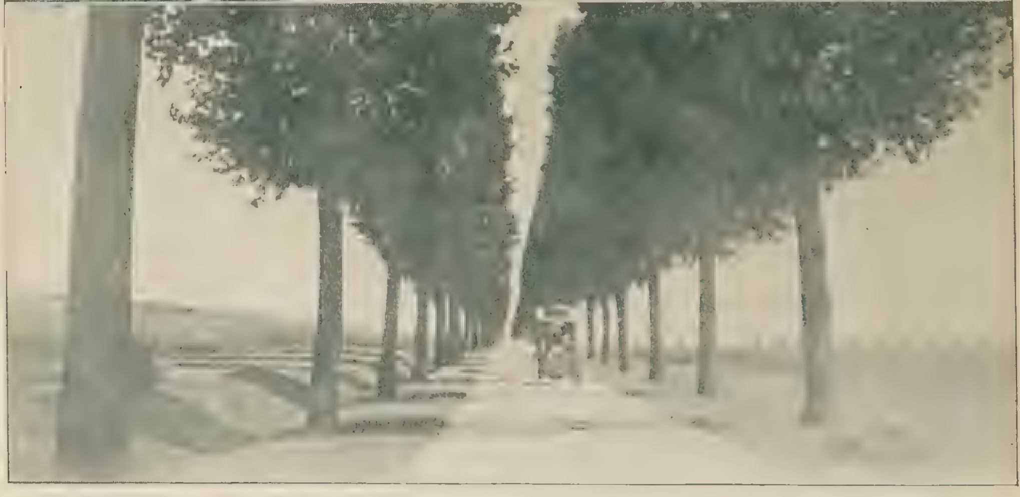




1 Rural road before improvement at Meridian, Miss.
2 Same road after improvement, Meridian, Miss.
3 Tractor train. Modern methods in road construction, Atlanta, Ga.
4 Type of traffic rapidly developing on American country roads







1 Avenue of the Sphinxes, Karnak, Egypt 2 The Appian Way as it is today
3 A good type of the National Roads of France

the highway districts or counties. However, the last turnpike in England and Wales, the Anglesey portion of the Shrewsbury and Holyhead road, did not go out of existence until 1 Nov. 1895.

In 1835 quite comprehensive legislation was enacted, relieving the parish of some of the burden of road maintenance by entirely abolishing statute labor and providing a money rate in its place. In 1878 a general act provided for taking over the turnpikes as their charters expired and in connection with the Act of 1888 provided for the care of these roads by the county and of all others by the district.

The greatest benefits to the turnpike roads, as well as to all the roads in general, however, came, not through acts of Parliament, but from the work of two individuals, Thomas Telford (1757–1834) and John Loudon MacAdam (1756–1836). Their work consisted mainly in devising more scientific methods of construction and maintenance. From 1800 to 1830, the methods advocated by these men, especially those of MacAdam, were largely adopted, not only in Great Britain but also in many parts of continental Europe and America. The types of construction developed by these engineers are still known throughout all English-speaking countries as macadam and telford.

In 1909 a further step in centralizing the road work of England was taken by Parliament in the establishment of a road board and providing national aid to the various county councils on roads carrying extraordinary traffic. In 1914 plans had been practically completed for further classification of the roads and for direct national aid and control on the more important roads of the kingdom. The war, however, caused all these plans to be postponed.

The early settlers of the United States brought with them the institutions of the mother country. The history of the development of road building in the United States, therefore, bears a marked resemblance to that of England, especially in the movement from extreme localization toward centralized control. Thus, the first road legislation in the United States, adopted by the House of Burgesses in Virginia in 1632, provided for the most extreme local control in the construction and maintenance of the public roads. Moreover, in much of the road legislation passed by the several colonies provisions for means and methods of local self-control form a striking feature.

Near the close of the 18th century the toll-road movement, then at its height in England, made its appearance in the United States. Charters were first granted to toll-road companies in Virginia in 1772, and what is said to have been the first toll road in the United States was established in this State between Alexandria and Sniggin's Gap in 1785. The Philadelphia-Lancaster turnpike which was begun in 1792 was the first toll road in the United States surfaced with broken stone.

The growth of the toll-road movement in the United States was at first extremely rapid and large amounts were invested. Almost invariably, however, the rate of tolls levied soon became a fertile source of complaint and dissatisfaction to the users of the road. In many cases the undertakings also proved unprofitable to the investors. Some States, especially Kentucky and Virginia, assisted in the construction of toll roads, either by direct appropriations or indirectly through the purchase of stock in the companies. In general, however, direct State participation in toll-road construction proved both unprofitable and unpopular and was consequently discontinued.

In 1806 the ever-growing demand for better means of communication with the West found expression in the adoption of an act by Congress providing for the construction of a National Road from the head waters of the Potomac to the Ohio River, which should be free from tolls. This act was later extended so as to provide for the construction of this road to the Mississippi River at Saint Louis. Actual progress, however, was slow. The first section from Cumberland, Md., to Wheeling, W. Va., was not completed and opened for traffic until August 1818. Gradually the construction was extended across Ohio and practically completed to Indianapolis. By this time, however, the rapid and successful development of railroad transportation had impressed Congress with the belief that the railroads were certain to supersede the wagon roads for all but the most extremely local traffic. Consequently, appropriations for the construction of the National Road became less and less and finally ceased in 1848 after the expenditure of nearly $7,000,000 of Federal funds. The road was only partially completed west of Indianapolis, and even the grading ceased entirely at a point near Vandalia, Ill.

With the coming of the railroads Federal as well as direct State participation in road construction or improvement ceased for nearly half a century. The appearance of the bicycle, however, in the latter part of the 19th century brought the need of better roads sharply to the public attention. A movement for more centralized direction found immediate favor as it was clearly impossible to secure any extensive, co-ordinated improvements so long as the various local bodies had unlimited control. The first definite result was the adoption of State aid in road improvement by New Jersey in 1891, which was followed by Massachusetts in 1892. Then came the motor vehicle with the attendant and ever-growing demand for better roads. The force of this demand can be readily understood from the fact that on 1 Jan. 1921, there were over 9,000,000 automobiles and motor trucks in use in the United States.

The movement for better roads, however, has steadily followed along the line of State aid and more centralized control in the management of the public roads. A still wider recognition of this movement was secured in 1916 with the passage of the Federal Aid Road Act, approved 11 July. This act authorizes the Secretary of Agriculture to co-operate with the States, through their respective State highway departments, in the construction of rural post roads. The particular roads to be improved are selected by the State highway department of each State and approved by the Secretary of Agriculture. For carrying out the provisions of this act, Congress appropriated $75,000,000, of which $5,000,000 was made available for the fiscal year 1917, and a sum increasing annually by $5,000,000 for each of the following years until 1921, when $25,000,000 will be available. An amendment to this act on 28 Feb. 1919 appropriated an additional $200,000,000 available for the fiscal years 1919, 1920 and 1921 and also $9,000,000 additional for forest roads available during the same period. Three per cent of the appropriation is available for administration and overhead expenses, and the remainder is apportioned to the several States on the basis of population, area and mileage of rural-delivery routes and star routes, each having a weight of one-third. The State must pay at least one-half of the cost of all the roads improved from Federal aid, and in addition, it, or its civil subdivisions, according to its laws, must maintain these roads after they are constructed. Under the same act $1,000,000 a year for 10 years was appropriated for the construction and maintenance of roads and trails in or partly within the national forests, in co-operation with the State, territory or county, upon a basis equitable to both parties. This Federal participation already has resulted in a marked activity on the part of the States, until at the present time every State in the Union has succeeded in establishing some form of State highway department and is providing for some form of State aid or assistance to the local communities.

**Current Highway Data.**— Cash expenditures on the rural roads and bridges in the United States in 1918 amounted to $286,598,000. To this should be added the value of the statute and convict labor, which cannot be fixed with any great degree of accuracy, but probably amounted to not less than $14,000,000, thus

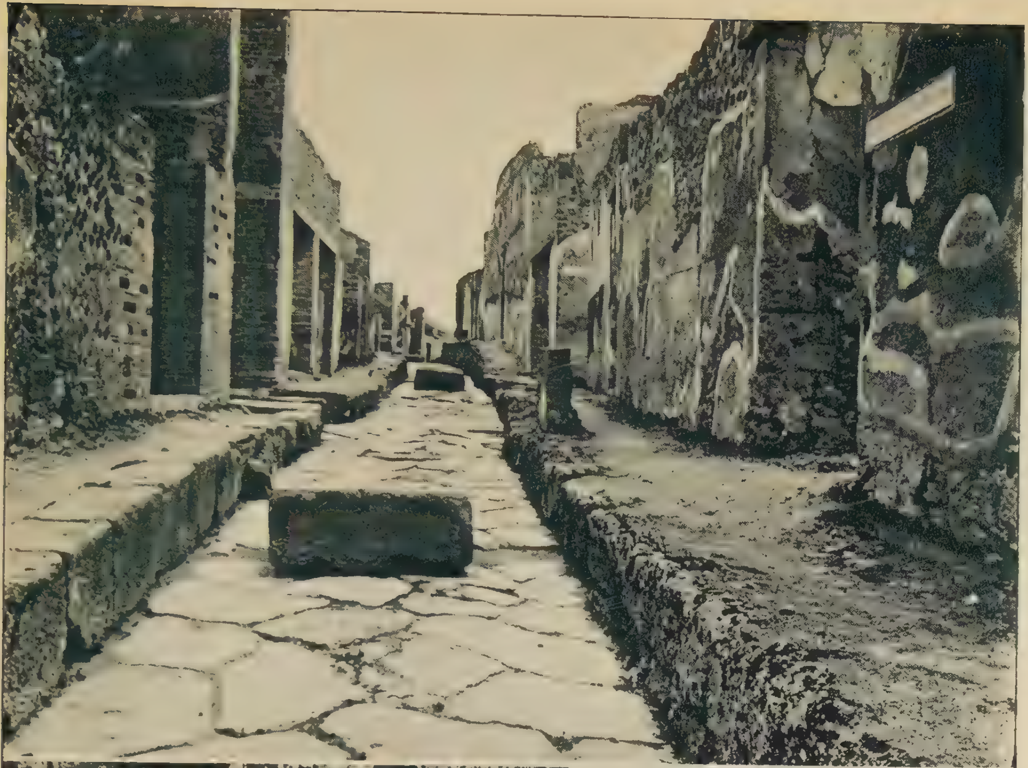
TABLE I.— CASH ROAD AND BRIDGE EXPENDITURES FOR THE CALENDAR YEARS 1914 AND 1916 AND MILEAGE FOR 1916.

| STATE | Year in which first State-aid law passed | State funds expended by or under State highway department | | Total cash expenditure from all sources | | Total all State and State-aid roads built to Jan. 1, 1917 | Mileage of rural public roads | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1914 | 1916 | 1914 | 1916 | | Total all surfaced roads in State (approximate) | Total all public rural roads in State | Percentage of surfaced roads in State |
| | | | | | | *Miles* | *Miles* | *Miles* | |
| Alabama | 1911 | $170,232 | $102,422 | $3,949,019 | $4,186,384 | 659 | 6,000 | 55,446 | 10.8 |
| Arizona | 1909 | ......... | 441,202 | 982,721 | 1,988,221 | 372 | 375 | 12,075 | 3.1 |
| Arkansas | 1913 | 115,000 | 55,483 | 1,522,696 | 3,443,887 | 534 | 1,500 | 50,743 | 3.0 |
| California | 1895 | ......... | 4,285,964 | 19,171,985 | 20,392,434 | 1,907 | 12,300 | 51,039 | 20.2 |
| Colorado | 1909 | 301,274 | 607,628 | 1,937,546 | 2,313,208 | *7,305 | 1,800 | 39,780 | 4.6 |
| Connecticut | 1895 | 1,307,381 | 1,865,948 | 3,640,963 | 3,200,948 | 1,627 | 3,100 | 14,061 | 22.0 |
| Delaware | 1903 | 31,000 | 31,000 | 511,628 | 512,000 | 160 | 275 | 3,674 | 8.0 |
| Florida | 1915 | ......... | 10,484 | 2,280,255 | 4,010,484 | ...... | 3,500 | 17,995 | 19.4 |
| Georgia | 1908 | ......... | ......... | 3,688,172 | 3,750,000 | ...... | 13,000 | 80,669 | 15.3 |
| Idaho | 1905 | 49,812 | 100,057 | 1,371,469 | 1,948,118 | 413 | 800 | 24,396 | 3.3 |
| Illinois | 1905 | 387,989 | 1,119,202 | 8,734,713 | 10,356,669 | 767 | 12,400 | 95,647 | 13.0 |
| Indiana | 1917 | ......... | ......... | 14,233,986 | 13,500,000 | ...... | 31,000 | 73,347 | 42.5 |
| Iowa | 1904 | 74,000 | 90,821 | 10,187,507 | 14,427,877 | ...... | 1,000 | 104,074 | 1.0 |
| Kansas | 1911 | 9,080 | 10,000 | 5,544,048 | 5,610,000 | ...... | 1,400 | 111,052 | 1.3 |
| Kentucky | 1912 | 18,000 | 708,346 | 2,474,621 | 4,448,533 | 1,611 | 13,400 | 57,916 | 23.2 |
| Louisiana | 1910 | 161,186 | 184,533 | 1,177,572 | 3,458,643 | 752 | 2,400 | 24,563 | 9.8 |
| Maine | 1901 | 467,149 | 1,055,250 | 2,642,007 | 3,167,215 | 1,798 | 3,250 | 23,537 | 13.8 |
| Maryland | 1898 | 356,845 | 2,280,000 | 6,000,652 | 5,560,000 | 1,321 | 2,900 | 16,459 | 17.6 |
| Massachusetts | 1892 | 242,560 | 2,701,236 | 6,091,875 | 6,499,141 | 1,998 | 8,900 | 18,681 | 47.6 |
| Michigan | 1905 | 657,264 | 982,939 | 9,261,998 | 10,082,939 | 3,940 | 9,600 | 74,190 | 13.0 |
| Minnesota | 1905 | 1,309,956 | 1,390,525 | 6,458,940 | 8,742,278 | 10,011 | 6,500 | 93,517 | 7.0 |
| Mississippi | 1915 | ......... | 6,500 | 3,960,377 | 3,256,500 | ...... | 2,600 | 45,779 | 5.7 |
| Missouri | 1907 | 277,253 | 482,860 | 5,513,049 | 7,982,860 | † | 7,250 | 96,041 | 7.6 |
| Montana | 1913 | 13,516 | 26,150 | 2,888,400 | 3,475,569 | 30 | 800 | 39,204 | 2.0 |
| Nebraska | 1911 | ......... | 110,000 | 1,796,278 | 4,500,000 | ...... | 1,350 | 80,272 | 1.7 |
| Nevada | 1911 | ......... | ......... | 245,014 | 275,000 | ...... | 320 | 12,182 | 2.6 |
| New Hampshire | 1903 | 491,520 | 414,669 | 1,590,464 | 2,045,410 | 1,280 | 1,900 | 14,020 | 13.5 |
| New Jersey | 1891 | 1,306,596 | 1,167,843 | 7,208,287 | 5,784,354 | 2,054 | 6,000 | 14,817 | 40.5 |
| New Mexico | 1909 | 115,732 | 385,684 | 556,399 | 828,952 | 846 | 550 | 11,873 | 4.6 |
| New York | 1898 | 8,544,126 | 9,409,655 | 23,231,964 | 19,901,391 | 6,765 | 18,000 | 79,398 | 22.7 |
| North Carolina | 1901 | 5,000 | 10,000 | 5,215,491 | 5,510,000 | ...... | 6,750 | 50,758 | 13.3 |
| North Dakota | 1909 | ......... | ......... | 2,402,384 | 2,711,295 | ...... | 1,100 | 68,796 | 1.6 |
| Ohio | 1904 | 1,855,338 | 2,885,071 | 14,334,246 | 12,992,625 | 1,299 | 31,500 | 86,354 | 36.5 |
| Oklahoma | 1911 | ......... | 300,000 | 2,112,681 | 3,625,000 | 1,900 | 300 | 107,916 | .3 |
| Oregon | 1913 | 10,697 | 165,662 | 5,310,467 | 5,955,662 | 413 | 4,875 | 36,819 | 13.2 |
| Pennsylvania | 1903 | 1,976,768 | 3,663,352 | 10,424,580 | 10,985,392 | 1,988 | 10,500 | 91,556 | 11.4 |
| Rhode Island | 1902 | ......... | 543,152 | 446,496 | 943,152 | 325 | 750 | 2,170 | 34.5 |
| South Carolina | 1917 | ......... | ......... | 1,024,480 | 1,250,000 | ...... | 3,700 | 42,226 | 8.8 |
| South Dakota | 1911 | ......... | ......... | 1,217,809 | 2,708,000 | ...... | 750 | 96,306 | .8 |
| Tennessee | 1915 | ......... | 200,000 | 2,370,560 | 4,600,000 | 150 | 8,750 | 46,050 | 18.9 |
| Texas | 1917 | ......... | ......... | 9,920,079 | 10,500,000 | ...... | 12,000 | 128,960 | 9.3 |
| Utah | 1909 | 157,732 | 179,400 | 803,071 | 1,855,160 | 3,440 | 1,500 | 8,810 | 17.1 |
| Vermont | 1898 | 458,456 | 632,800 | 1,023,941 | 1,607,800 | 2,011 | 2,100 | 14,249 | 14.9 |
| Virginia | 1906 | 523,578 | 542,524 | 3,224,529 | 3,691,249 | 4,463 | 5,500 | 53,388 | 10.3 |
| Washington | 1905 | 1,343,431 | 859,672 | 7,944,717 | 7,518,343 | 1,977 | 5,900 | 42,428 | 13.9 |
| West Virginia | 1909 | ......... | 10,967 | 2,483,747 | 5,510,967 | ...... | 1,532 | 32,024 | 4.7 |
| Wisconsin | 1911 | 1,482,379 | 950,000 | 9,880,240 | 10,570,764 | 5,070 | 14,850 | 75,707 | 19.6 |
| Wyoming | 1911 | ......... | ......... | 669,661 | 450,000 | ...... | 520 | 14,797 | 3.5 |
| Total | ...... | 24,220,850 | 40,969,001 | 240,263,784 | 272,634,424 | 69,186 | 287,047 | 2,455,761 | 11.6 |

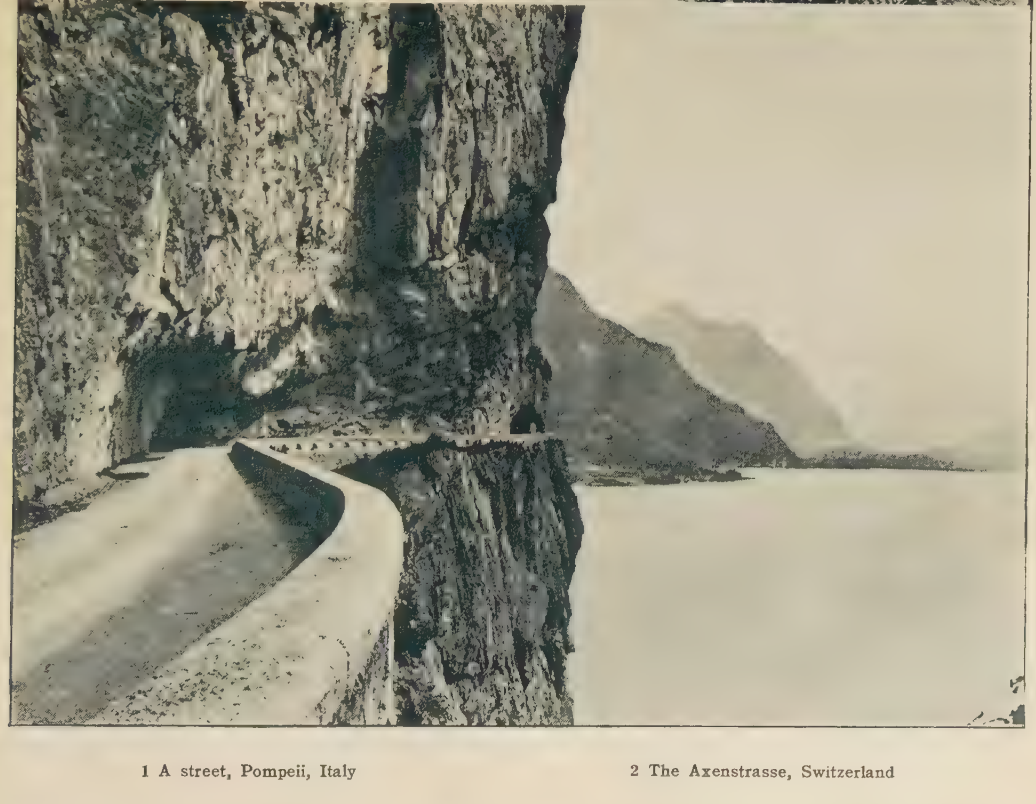
* Includes about 6,300 miles of earth roads. † No data.

(Adapted from U. S. Department of Agriculture, Office of the Secretary — Circular No. 74.)

# ROADS AND HIGHWAYS



1 A street, Pompeii, Italy



2 The Axenstrasse, Switzerland

making the grand total expenditure for the year $300,000,000. This total is made up of the actual expenditure for such items as labor, materials, supervision, management and administration directly connected with the construction, improvement and upkeep of our public roads and bridges. During 1917 the grand total expenditure amounted to approximately $280,000,000.

This, however, does not represent the total outlay by the States and communities because of their rural public roads. At present there are outstanding more than $400,000,000 of road and bridge bonds and long-term warrants, maturing at the rate of about $20,000,000 per year and requiring about an equal amount for the payment of interest charges. These outlays are not included in the totals.

From 1904 to 1915, inclusive, the annual increase in the expenditures on rural roads and bridges amounted to approximately 12 per cent over each preceding year. The increase of 1916 over that of 1915, however, was only 2 per cent, and that of 1917 over 1916 about 1 per cent. This was due largely to the scarcity of labor and materials which caused an unusually large amount of road work to be deferred.

The public rural roads of the United States at present have a total length of 2,478,332 miles, of which about 299,000 miles, or 12.0 per cent, are improved with some form of surfacing. The mileage of hard-surfaced roads is increasing at the rate of about 12,000 miles per annum. During 1918 the State highway departments surfaced about 4,000 miles under State supervision and also improved an additional 7,000 miles by grading or otherwise. The several State highway departments also supervised the maintenance of 200,000 miles of main and trunk-line highways.

In regard to our city and village streets no such exact data are available. Their total length is estimated at 250,000 miles and the total annual expenditure for construction, improvement and maintenance at more than $300,000,000. In general, their control in regard to construction and maintenance is vested entirely in the respective local authorities without any State assistance or supervision.

The expenditures in 1916 by or under the various State highway departments and also the expenditure of State and local funds for the years 1904, 1914, and 1916, as well as the total rural road mileage and that improved, are shown in Table I on preceding page.

**Austria-Hungary.**[1]— Before the Revolution the central government had general supervision of all roads. The state roads were constructed and maintained at the expense of the imperial government, while the cost of the lesser roads were borne by the various political subdivisions according to their importance with or without government grants. In 1914 there were in Austria 10,008 miles of state, 2,288 miles provincial, 39,212 district and 22,756 miles of town roads, or a total of 74,265 miles of all classes of roads. In Hungary there were 5,600 miles of state, 17,400 miles of county, 8,100 miles of district and 700 miles of parish roads, or a grand total of 31,800 miles. In Austria the average annual cost of maintaining the state roads was $311 per mile and $282 per mile in Hungary, exclusive of bridges.

**Canada.**— Canada has no central road organization, but the control of the public roads is vested in the respective provinces through their local subdivisions. However, in line with the road movement in the United States the several provinces have established provisions for more or less provincial aid and control, the form of which is not exactly alike in any two provinces. The total mileage in the Dominion amounts to about 250,000 miles of graded roads. Surfaced roads are confined largely to Ontario, Quebec and British Columbia. The annual road and bridge expenditures amount to about $22,000,000, or about $88 per mile. On 4 July 1919 the Federal Parliament passed an act providing for $20,000,000 in Federal aid to the province during a period of four years. Each province through its highway department is to receive $80,000 annually plus 40 per cent of the cost of such road work as is approved by the Federal Road Department within the limits of the total allotment to each province.

**Great Britain.**— The only national highway authority is the road board established in 1910, which has the power to make contributions toward approved schemes of improvement and until 1916 was provided with revenues from the motor vehicle registration fees and the license tax on motor spirits, amounting to about $8,000,000 annually. Otherwise, the roads and streets of England and Wales are maintained by 1,891 local authorities, those of Scotland by 337 and those of Ireland by about 370 local authorities. England and Wales have a total of 152,085 miles of roads, of which 33,624 miles were in urban areas or practically city streets. The average annual expenditure is about $52,000,000, or $730 per mile on the city streets, and $28,000,000 or $230 per mile on the rural roads. Of the roads in rural areas, however, 23,833 miles, or 20 per cent, are classed as main roads and require an annual expenditure of about $600 per mile. Scotland has 24,908 miles of roads of which 2,244 might be classed as streets. The average annual expenditure on the streets amounts to about $2,500,000, or about $1,000 per mile, and $4,000,000, or $175 per mile, for the rural roads. Ireland has a total of 58,334 miles of road which cost annually about $5,000,000, or $86 per mile.

**France.**— The roads are divided into three general classes — national roads, 23,756 miles, built and maintained entirely by the national government; departmental roads, 8,161 miles, maintained at the expense of the departments and 331,855 miles of vicinal roads, built and maintained by the communes with occasional subsidies by the national government. In addition there are about 155,000 miles of rural lanes of entirely local importance. The national roads as well as most of the departmental roads are under the care of the corps of bridges and roads of the ministry of public works consisting of a complete, non-political organization from the highly trained engineers and administrative officials down to the road men or cantonniers. Each cantonnier has immediate charge of about 2.8 miles of road. The average annual cost of maintaining the national roads is about $335 per mile, the departmental roads $190 per mile, and the vicinal roads about $110 per mile.

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[1] Statistics relating to continental European countries refer to 1914 or the pre-war period.

**Germany.**— The construction and maintenance of the public roads is in the hands of the several states without any control from the central authority. Classification and methods of management and control differ among the several states. In general, however, the roads are divided into state or provincial roads, under the control of the state or province, county or district roads under the district, and parish or local roads which are usually a local burden. There are approximately 36,000 miles of improved state roads distributed as follows: Prussia, 20,489 miles; Bavaria, 4,200 miles; Saxony, 2,267 miles; Baden, 1,890 miles; Würtemberg, 1,710 miles; and the other small states 444 miles. Of county roads Prussia has 38,400 miles, 14,598 miles of parish roads and 1,100 miles of private roads, all of which are improved with a hard surface. The total annual road expenditure in Prussia is about $35,000,000, of which the provinces pay 28 per cent, the districts 33 per cent, and the parishes 39 per cent.

**Italy.**— The roads of Italy aggregate a total of 92,000 miles divided as follows; National, 5,200 miles, built and maintained by the national government at an annual average cost of $275 per mile; provincial roads, 27,800 miles, built and maintained by the provinces at an average cost of $185 per mile, and 59,200 miles of local roads provided for by the communes.

**Norway.**— The roads of Norway have a total length of 17,550 miles, of which 6,570 are main roads for the construction of which the national government has contributed from two-thirds to three-fourths of the cost. The cost of maintenance is almost entirely a local burden, though under the supervision of a national director of roads.

**Russia.**— There are about 12,000 miles of post roads in Russia either under the control of the ministry of ways and communication or the department of war. The average annual maintenance cost of these roads is about $200 per mile. The cost of other roads is borne by the local communities.

**Spain.**— There are about 34,000 miles divided into state and provincial roads. The state roads are constructed and maintained by the general government through the department of public works at an annual average cost of about $240 per mile.

**Sweden.**— There are 36,000 miles of road in Sweden made up of 12,000 miles of main and 24,000 miles of district roads. On the main roads which are under the supervision of the royal board of road building and waterworks the government pays two-thirds of the cost of construction and 15 per cent of the maintenance. The total annual expenditure is about $70 per mile for all classes.

**Switzerland.**— Switzerland has no central road authority. The roads are left to the cantons and their municipalities, though the federal government grants aid to certain more important roads, which have a total length of about 550 miles. The cantonal roads have a length of 875 miles and local roads 6,250 miles.

Andrew P. Anderson,

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**ROAN ANTELOPE,** a large and handsome South African antelope (*Hippotragus equinus*), related to the exterminated blaaubok and the beautiful sable antelope, which is of a reddish hue, with strong black and white markings on the face. It is becoming very rare.

**ROANNE,** rō-än, France, town in the department of the Loire and an important railway junction, 59 miles by rail northwest of Lyons. Extensive engineering workshops are located here, besides iron and copper foundries, many dye-works, pottery and tile works. Pop. about 36,000.

**ROANOKE,** Va., city in Roanoke County, on the Roanoke River and on the Norfolk and Western Railroad, 53 miles west of Lynchburg. Roanoke was formerly a leading tobacco market, but in later years has become the centre of a large section rich in iron mining and farming interests. Roanoke has extensive iron manufacturing interests, rolling mills, tobacco factories, bottling works, box factories, locomotive and car shops, canning factories, wheel and spoke factories, machine shops, saw mills, planing mills, wooden-ware factories, knitting and silk works, iron furnaces, bridge works, foundries, rolling mill, cotton mill, carriage and wagon factories and many smaller industries. The Virginia College for young ladies and the National Business College for both sexes are located here, and the famous Hollins Institute for young ladies is located within seven miles of Roanoke. There is also a very fine high school, and grammar and other schools, courthouse, city-hall, Academy of Music, and numerous fine business blocks. The city is governed by a mayor and city council elected by the people. There is an excellent paid fire department and electric street railways and electric lights. The city has an improved sewer system and two waterworks plants. There are several national and State banks, excellent hotels, daily and weekly newspapers and monthly periodicals. Roanoke, prior to 1880 known as Big Lick, was incorporated in 1884, and has grown steadily in population, wealth and solid industry. Its present population is 50,842.

**ROANOKE,** a river in Virginia and North Carolina, formed by the confluence of the Dan and Staunton rivers at Clarksville, Va. It flows south and southeast for nearly 300 miles, entering the Atlantic Ocean through Albemarle Sound. It is a tidal stream fully 80 miles from its mouth and is navigable to its source. The Dan and Staunton are navigable for small vessels for some distance from the Roanoke. At Halifax, N. C., there are rapids and falls which furnish considerable water power. A canal has been built around this obstruction to navigation.

**ROANOKE COLLEGE,** located at Salem, Va. It was established in 1853 under the auspices of the Evangelical Lutheran Church, and is governed by a self-perpetuating board of trustees. It offers a classical course, leading to the degree of A.B., and a business course, and has also a preparatory department. It is coeducational, but few women have enrolled. The college possesses a numismatic collection of considerable value, a library with about 25,000 volumes, and grounds and buildings valued at over $700,000. The endowment funds amount to over $215,000 and the annual income to about $70,000. The annual enrolment of students is over 200; the faculty numbers 22.

**ROANOKE COLONY, The,** in American colonial history the name applied to a famous land grant of the Crown. In 1584 Sir Walter Raleigh, having obtained a large grant of land from Queen Elizabeth, sent out 9 April, seven vessels and 108 settlers under the command of Sir Richard Grenville. After skirting the West Indies and Hispaniola, they landed at Roanoke, in North Carolina, 20 June. Ralph Lane was left in charge of the settlement and Grenville returned to England. During the following winter Lane made numerous exploring expeditions and suffered greatly from Indian attacks. In the spring he received some aid in men and supplies from Sir Francis Drake, but finally the settlers persuaded Drake to take them home. Soon after Grenville arrived with new settlers. These had been destroyed by the Indians when, in 1587, a new colony of Raleigh's, under White, came out. White himself returned to England. When he came back (1590) he found the colony vanished. It seems to have been destroyed by the savages, though there is a theory that descendants of the colonists are still to be found among North Carolina half-breeds.

**ROANOKE ISLAND, Battle of.** After the capture by Union troops of fort Hatteras and Clark, at Hatteras Inlet (q.v.), 29 Aug. 1861, the Confederates began to erect works on Roanoke Island, to command the narrow channel connecting Albemarle and Pamlico sounds, considered as the key to one-third of North Carolina, the possession of which by the Union forces would enable them to reach the railroad connecting Richmond with New Orleans. The Union authorities decided to seize the position, and 7 Jan. 1862 General Burnside, who had a division of 12,000 men, was ordered to seize and hold Roanoke Island, capture Newbern and Fort Macon, open the harbor of Beaufort and, if practicable, to advance from Newbern and seize the railroad to Goldsboro. On 7 January vessels carrying the troops set sail from Annapolis, and by night of the 10th more than 80 vessels of all kinds had rendezvoused at Fort Monroe, 20 being war vessels, carrying over 60 guns, under command of Flag-Officer L. M. Goldsborough. The fleet was divided into two columns under commanders S. F. Hazard and S. C. Rowan. The expedition sailed from Fort Monroe on the night of the 11th, and after many mishaps, in which some vessels were lost, by 4 February had passed into Pamlico Sound, and orders were given for the advance on Roanoke Island. On the morning of the 5th the start was made, with 65 vessels in all, naval vessels and transports. On the 7th the armed vessels engaged the Confederate batteries on the west side of Roanoke Island, and also small gunboats, which were soon driven off. The forts were silenced and on the morning of the 8th, Burnside had over 8,000 troops and a battery ashore at Ashby's Harbor. Confronted by Confederate works, manned by nearly 6,000 men, he had formed his division into three brigades, commanded by Gens. J. G. Foster, Jesse L. Reno, and John G. Parke. The advance was ordered early in the morning, Foster leading, in the centre, Parke on the right and Reno on the left. While Foster pressed the front and engaged with his artillery, Reno marching at times waist-deep in the mud of the swamps, gained the right of the Confederate position, Parke in the same manner gaining the left, and, after a more than three hours' fight, a simultaneous charge was made and the entire position carried. This cleared the road. Burnside marched to the head of the island, where the forts on the shore and their entire garrisons were captured. The Union loss was 37 killed 214 wounded and 13 missing. The Confederate loss was 23 killed, 58 wounded, 62 missing and about 2,650 captured, including 159 officers. The Confederate gunboats went up Albemarle Sound to Elizabeth City, pursued next morning by Commander Rowan, with 14 vessels. Rowan promptly attacked, and after a short but severe engagement, Lynch, the Confederate commander, ordered the abandonment of his boats, ran them aground and set them on fire. Rowan had two killed and six wounded. Having gained entire possession of Roanoke Island and the control of the inland waters of North Carolina, Burnside's next step was the capture of Newbern (q.v.). Consult 'Official Records,' Vol. IX; the Century Company's 'Battles and Leaders of the Civil War,' Vol. I. See NEWBERN, OPERATIONS AT, IN THE CIVIL WAR.

E. A. CARMAN.

**ROARING,** a disease of horses whereby the air-passages are partially obstructed, giving rise, when the horse is briskly exercised, to a peculiar noise in breathing. The disease is due to inflammation of the larynx or of the windpipe, with wasting or paralysis of some of the laryngeal muscles, whereby the glottis becomes contracted. The fluid discharged from the affected parts, changing into a tough, viscid substance, adheres to the larynx and upper part of the windpipe and further obstructs them. But the specific causes of roaring are various. It sometimes follows strangles. Carriage-horses are more subject to it than saddle-horses, because of the injury done to the larynx by tight reining. There are also various kinds of roaring, distinguished by the sounds, as whistling, wheezing, high-blowing and piping. The disorder does not appear to be amenable to treatment, though in early stages, as when it proceeds from catarrh or influenza, it may be relieved by blisters or setons. The disease renders a horse unsound, as it unfits him for the ordinary strain of work.

**ROARING BUCKIE,** common Scottish name for the red whelk (*Chrysodomous antiquus*) so-called because of the sound heard when held to the ear and believed by the uninformed to be the murmur of the sea from which the shell came.

**ROARING FORTIES,** a sailor's term for a region of the great Southern Ocean lying south of lat. 40° to 45° S., where strong and often stormy west-northwest winds prevail. Owing to these winds the outward voyage to Australia by sailing vessels is made via the Cape of Good Hope and the homeward voyage via Cape Horn. The same name is sometimes given by analogy to a belt of the North Atlantic about 40° to 50° N.

**ROASTING.** See COOKERY.

**ROB ROY**, a romance of the Scottish border, written by Sir Walter Scott and published anonymously in 1818, takes its name from the famous Highland brigand, Rob Roy MacGregor Campbell, who is at the time of the story engaged in the Jacobite plots which led to the uprising of 1715. The narrative is put into the mouth of Francis Osbaldison, son of a London merchant. Exiled to the home of his uncle, near the border, he falls in love with the highly unconventional Diana Vernon and incurs the hostility of Rashleigh Osbaldison, a dark villian, who is at first an adherent of and later a traitor to the Jacobite cause. In endeavoring to recover certain papers stolen by Rashleigh, the loss of which will ruin the house of Osbaldison, Francis makes an expedition to the Highlands and witnesses the exciting conflict between Rob Roy's outlaws and the forces which the government has sent to capture him. He is befriended by the brigand, and after the suppression of the revolt succeeds in winning the hand of Diana.

For bibliography, consult IVANHOE.

JAMES H. HANFORD.

**ROBALLO**, family of American fishes (*Centropomidæ*) comprising one genus and about 15 species. The family is characterized by an elongated body, a pike-like head, ctenoid scales, a projecting lower jaw, dorsal fins well separated and villiform teeth. They are nearly all game fishes and of some food-value. Their habitat is salt or brackish water and their habits closely resemble the bass. The Pacific robalo (*Centropomus viridis*) is found from Baja, Cal., south to Panama. It reaches a length of two to four feet and is of value as a food-fish. The common robalo or snook (*C. Undecimalis*) is the best known species and is also the largest and most abundant. It is very common in West Indian and Florida waters. It reaches a length of three and one-half to four feet. It is valued as a food-fish in Porto Rico. Southward from Cuba to Pernambuco is found the species *Parallelus*, which enters rivers and is sometimes found far from salt water. It attains one foot in length and is valued as a food-fish. The roballo is said to take the hook readily and even to rise to the fly. Consult Jordan, D. S., and Evermann, B. W., ‹American Food and Game Fishes› (New York 1902).

**ROBBER COUNCIL.** See EUTYCHES.

**ROBBER-FLY**, bee-killer, many species of mostly large, slender and long-bodied (sometimes stout) strong and active flies of the family *Asilidæ*, which prey upon many kinds of insects, by darting upon them in mid air and stabbing them with their dagger-like beaks.

**ROBBER, PALM or COCOANUT CRAB**, a large and powerful land-crab (*Birgus latro*) of the East Indies, related to the hermit-crabs, which lives in a hole in the earth under trees, lining its burrow with the fibrous cocoanut husks, has an almost lung-like modification of the gill-cavity for breathing air directly, yet visits the sea annually in droves to spawn. It goes abroad only at night and feeds on cocoanuts, though it does not climb for them, and is itself eaten in Amboyna and elsewhere. Darwin has graphically described how it tears the husk from the cocoanuts and hammers on the round depressions at one end until entrance is effected. Consult Forbes, ‹A Naturalist's Wanderings› (1885).

**ROBBERY**, is the wrongful taking, without a claim of right, of a thing of value from one's person against his will, or by force, or through placing him in fear. In the United States the offense is regulated by the statutes of the various jurisdictions, in some of which the degree of guilt depends on the nature of the act. Actual force need not be employed to induce fear, and fear may extend to a threatened destruction of one's property or injury to reputation. The law does not hold that the property must be in the actual physical possession of one, or in contact with his person, but merely that it must be in his presence, or in his immediate control; the property need not belong to the person from whom it is taken. Two or more persons may be equally liable for robbery if participating in any of the acts by which it is carried out. Punishment for robbery is fixed by statute.

**ROBBIA**, rŏb'bē-ā, **Luca della**, Italian sculptor: b. Florence, 1400; d. 1482. In the Early Renaissance he appeared as the foremost artist of all his contemporaries, and created a new school of sculpture by his marble friezes for the organ-loft of the Duomo at Florence. These are still to be seen in the Bargello Palace of the same city. The work was completed in 1445 and represents in 10 panels, angels and boys singing and playing on various instruments, to the rhythmic movement of the dance. For refined and chastened fancy, skilful grouping and animated expression this masterpiece showed a vast advance on the hieratic sculptures of mediævalism. The enthusiasm with which it was greeted was redoubled, when in conjunction with Michelozzo and Maso di Bartolommeo, he executed the bronze doors for the Old Sacristy of the Duomo (1446–64). His name is, however, especially associated with works in clay reduced to pottery in the kiln, and colored and glazed like faience. This faience sculpture was unknown before his time and in it he improved the common process of glazing by a new method all his own. Numberless were the reliefs, medallions, tympanum groups, altars and other decorations which he and his pupils produced in this style. He began by plain white reliefs on a flat blue ground; the flawless beauty of his profiles in many sculptures of this kind have been the inspiration of succeeding artists. But he gradually enriched the coloring by the addition of other tints, some critics think, with a loss to classic purity and simplicity; yet the harmonious composition of his designs, the charm of expression which appears in everything he did, added to the boldness with which he ventured into a new field of plastic art have won for him a sort of unique glory among the artists of the Renaissance. His works and those of his pupils are met with in every part of Tuscany, and some examples may also be seen in the museums of Europe. Among his most eminent pupils were his nephew, Andrea della Robbia (1437–1528); and the sons of this latter, Giovanni (1469–1529) and Girolamo (1488–1566). Consult Barbet de Jouy, ‹Les Della Robbia› (1855); Cavalucci et Mohnier, ‹Les Della Robbia› (1884); Leander Scott, ‹Luca Della Robbia› (1883).

**ROBBIN,** rŏb'ĭn, **Albert Farthing,** English writer: b. Launceston, Cornwall, 1 Aug. 1856. He entered journalism in 1871 and has long been London correspondent of the Birmingham *Post.* In addition to several comedies and other dramas he has published ‹Practical Politics or the Liberalism of To-day› (1888); ‹The Early Public Life of William Ewart Gladstone› (1894), etc.

**ROBBINS,** rŏb'ĭnz, **Wilford Lash,** American Protestant Episcopal clergyman: b. Boston, Mass., 7 Aug. 1859. He was graduated from Amherst in 1881, studied at Cambridge Theological Seminary, was ordained deacon in 1884 and held his first charge at Lexington, Mass., in 1885–87, where he was advanced to the priesthood in the following year. He was appointed dean of the Cathedral of All Saints at Albany 1887–1903 and in the year last named became dean of the General Theological Seminary, in which relation he remained until 1916. He has published ‹An Essay Toward Faith› (1900); ‹A Christian's Apolegetic› (1902), etc.

**ROBERT I,** king of Scotland. See BRUCE, ROBERT (3).

**ROBERT II,** king of Scotland, son of Walter III, steward of Scotland, and Marjory, daughter of Robert Bruce; b. Scotland, 2 March 1316; d. Dundonald Castle, Ayrshire, 13 May 1390. He was recognized as heir to the Scottish throne by Parliament in 1318, but superseded by a son afterward born to King Robert, who succeeded him in 1329 under the title of David II. In 1333, Robert, then steward of Scotland, was a leader at Halidon Hill and in 1334 was appointed joint regent with Moray. In 1338–41 he was sole regent and after the battle of Neville's Cross in 1346, where King David was taken prisoner, was again made regent. After the death of David in 1371 Robert was declared king and was crowned shortly afterward, the first of the Stuart dynasty. He ratified a treaty with France in the first year of his reign, and continued a nominal truce with England until the succession of the English king, Richard II, with whom he waged two wars. In the latter of these Richard II and the Duke of Lancaster made successful forays into Scotland. In 1388 these were avenged by an invasion of England by two armies and the famous battle of Otterburn (Chevy Chase) was then fought. The long-continued border wars and the disorders caused by the turbulent barons caused the king, whose increasing age disinclined him to the arduous duties of reigning, to entrust the management of the kingdom to his second son, the Duke of Albany, in 1389, and he then retired from public life.

**ROBERT III,** king of Scotland, eldest son of Robert II: b. Scotland, about 1340; d. Rothesay, Bute, 4 April 1406. He was originally known as John Stuart, Earl of Carrick, but assumed the name of Robert on his coronation in 1390. He possessed little strength of mind and incapacitated for military service by his lameness, delegated, therefore, the guidance of military affairs to his brother, the Duke of Albany. The friends of the king's eldest son, the Duke of Rothesay, forced the abdication of Albany in 1398 and war was renewed with England. Scotland was invaded for the last time by an English king in 1400, and in 1402 the Scottish troops met with disastrous defeat at Homildon Hill. Albany then regained the regency, imprisoned Rothesay at Falkland Castle, where he starved him to death, and caused Robert III, in his terror of him, to send his second son James to France for safety. James was captured and imprisoned by the English and his father on learning of the event went into melancholy and died soon after. Scott's ‹Fair Maid of Perth› is based upon various incidents related above.

**ROBERT, Christopher Rhinelander,** American philanthropist: b. Brookhaven, N. Y., 23 March 1802; d. Paris, France, 28 Oct. 1878. He was a merchant's clerk in New York for five years before engaging in business for himself at New Orleans; and in 1830 he returned to New York, became head of the firm Robert and Williams and also president of a large coal and iron company. He amassed a fortune and in 1862 retired from business. He was a generous benefactor of Hamilton College and of the Auburn Theological Seminary, but was chiefly interested in the American College at Constantinople, which was later named Robert College in his honor. His gifts to it during his lifetime and by bequest totalled $461,000.

**ROBERT, Henry Martyn,** American military engineer: b. Robertville, S. C., 2 May 1837; d. Hornell, N. Y., 11 May 1923. He was graduated from West Point in 1857, was assistant professor of natural philosophy, and later of military engineering there in 1857–58 and served on frontier duty 1858–61. He was on duty as an engineer officer through the Civil War, was promoted captain in 1863, and major in 1867, and served as professor of practical military engineering at West Point in 1865–67. In 1867–90 and 1891–95 he was on duty in connection with river and harbor improvements, lighthouses and fortifications. In 1890–91 he was engineer commissioner of the District of Columbia. He was made president of the board of engineers for fortifications and of the New York and Philadelphia Harbor Line Boards, and division engineer of the southwestern division including river and harbor improvements from Pittsburgh to Galveston. He was promoted brigadier-general chief of engineers in 1901, and was retired shortly after. After his retirement he acted as president of the board which designed the Galveston seawall and grade raising, and was consulting engineer to design the causeway-bridge connecting Galveston Island with the mainland. In 1911 he planned the improvement of the port of Frontera, Tabasco, Mexico. He is the author of ‹Rules of Order› (1876), and ‹Rules of Order Revised› (1915); ‹Index to Report of Chief of Engineers of the United States Army on River and Harbor Improvements from 1866 to 1887› (Vol. I, 1881; Vol. II, 1889).

**ROBERT, Louis Leopold,** French painter: b. Les Eplatures, near Chaux-de-Fonds, Switzerland; d. Venice, 20 March 1835. His teachers were the copperplate engraver Girardet in Paris, and the painter David. In 1818 he visited Rome and the study of life among the common people there furnished material for some of his smaller genre pictures. He was especially happy in his representation of robber life in Italy, and his ‹Sleeping Brigand› in the National Gallery at Berlin is much admired. But it was at Naples that he found material for his first masterpiece ‘The Improvisator’ (1823). This was succeeded by ‘The Return from the Festival of the Madonna’ (1827), now in the Louvre; ‘The Arrival of the Reapers in the Pontine Marshes’ (1830) in the Louvre; of which latter a replica with variations is in the Berlin National Gallery. In 1832 he visited Venice and completed ‘The Departure of the Fishermen of the Adriatic.’ An unrequited attachment for the Princess Charlotte Bonaparte preyed upon his mind and he committed suicide in Venice. In his pictures the life of the Italian common people is delicately idealized, and among his contemporaries his works were greeted as they appeared with the greatest enthusiasm.

**ROBERT, Duke of Normandy,** surnamed THE DEVIL: d. Nicæa, Asia Minor, 22 July 1035. He was the younger son of Duke Richard II and ascended the throne in 1028 in succession to his brother, Richard III, whom he was said to have poisoned. The earlier years of his reign were passed in the subjugation of his vassals. Then he interfered in various princely quarrels, restoring Baldwin IV of Flanders to his estates, and aiding Henry I of France against the plots of the latter's mother. In 1034 he undertook an expedition against England, in support of his nephews, whom Canute had excluded from the succession, but his fleet was wrecked off Jersey, and the attempt failed. He now set out on a pilgrimage to Jerusalem; and while returning died suddenly in Nicæa, poisoned, perhaps, by his servants. His heroic deeds and penance have given rise to numerous stories. ‘La Vie du terrible Robert le Diable, lequel fut après l'homme de Dieu’ appeared in 1496, and was much imitated. On it was based the grand opera ‘Robert le Diable,’ text by Scribe and Delavigne, music by Meyerbeer. William the Conqueror was his son. Consult Tardel, ‘Die Sage von Richard dem Teufel’ (1900).

**ROBERT, Duke of Normandy,** eldest son of William the Conqueror: b. about 1054; d. Cardiff, Wales, 10 Feb. 1134. In 1087 he succeeded his father as Duke of Normandy, but not as king of England, and he made no serious effort to take the throne from his younger brother, William II, although he received offers of assistance in the project. His rule in Normandy proved irresolute, he lost the county of Maine, and was continually engaged in quarrels with his brothers. In 1096, however, Robert and William II reached an understanding, and Robert, pledging his duchy to William for five years in order to raise 10,000 marks, set out on the first crusade. He greatly distinguished himself during the operations leading to the capture of Jerusalem and is said to have refused to become king of the new Latin Kingdom. He returned to Normandy in 1100, to find William II dead and his younger brother, Henry, on the throne. He journeyed to England in 1101 to claim the succession but was persuaded to withdraw. In 1106, however, Henry invaded Normandy, took Robert prisoner at the battle of Tinchebrai, 28 Sept. 1106, and kept him in prison the remaining 28 years of his life. While deprived of his liberty and detained successively in the Tower of London, and the castles of Devizes and Cardiff, Robert is said to have been otherwise well-treated. Consult Freeman, E. A., ‘History of the Norman Conquest’ (1870–76); and ‘The Reign of Rufus’ (1882).

**ROBERT OF BRUNNE.** See BRUNNE, ROBERT OF.

**ROBERT COLLEGE,** Constantinople, Turkey, so called after Christopher R. Robert of New York, its chief benefactor, was organized by James H. and William B. Dwight, sons of the Rev. Harrison G. O. Dwight, an American missionary to Turkey. It was opened in 1863, its financial support being guaranteed by the philanthropy of Mr. Robert who died in 1878, and whose total contributions to the institution amounted to $450,000. In 1864 the college was affiliated with the University of New York. Its first president was the Rev. Cyrus Hamlin, D.D., who at his resignation in 1877 was succeeded by the Rev. George Washburn, D.D. The curriculum is similar to that of the average American college; while English is the principal language in use, instruction is also given in 13 other languages. The first home of the college was in a private house; the two college buildings built in 1871 and 1891 respectively occupy a fine site on the Bosporus.

**ROBERT ELSMERE,** a novel by Mrs. Humphry Ward, published in 1885. It is a brilliant example of the embodiment in a work of fiction of intellectual problems of contemporary interest and recounts the struggles of an Anglican clergyman who cannot accept all the miracles and dogmas of Christianity, while in deep sympathy with its spirit. The work had a phenomenal success, partly owing to the nature of its subject, and partly to its genuine literary merit. Aside from its intrinsic value, the sensation it produced entitles it to rank as one of the most remarkable books of its generation.

**ROBERT-FLEURY,** rō-bār, flê-rĭ, **Joseph Nicolas,** French painter: b. Cologne, 8 Aug. 1797; d. Paris, 5 May 1890. In early life he studied under Gros at Paris, and after visiting the galleries and studios of Italy finally settled in the French capital. His works are distinguished for impressive characterization and profound sentiment; and among them may be mentioned ‘Night of Saint Bartholomew's’ (1833); ‘Religious Conference at Poissy in 1561’ (1840); ‘Jane Shore after her Condemnation Insulted by the People’ (1850); ‘Sack of a Jew's House at Venice in the Middle Ages’ (1855); the last three are in the Luxembourg Museum. He also decorated with paintings the hall of the Chamber of Commerce at Paris.

**ROBERT-FLEURY, Tony,** French painter: b. Paris, 1 Sept. 1837. He was a pupil of Delaroche and Cogniet and is known for his historical and genre pictures, as well as for portraits. Among his best works are ‘Warsaw on 6 April 1861’; ‘Scene During the Polish Insurrection’; ‘The Old Women of the Piazzo Ravona, Rome’ (1867, in the Luxembourg); ‘The Daughters of Danaus’ (1873); ‘Charlotte Corday at Caen in 1793’ (1874); ‘The Sack of Corinth’ (1870, in the Luxembourg); and a ceiling picture in the Luxembourg ‘The Apotheosis of French Sculpture.’

**ROBERT OF GLOUCESTER,** English historian. He was a monk in the abbey of Gloucester in the latter half of the 13th century, but of his life there is nothing known. His history of England extends from the fabulous Brutus to about 1300 A.D. The work is written in Anglo-Saxon showing the transition stage of the language previous to Chaucer, and its chief value is linguistic. It is in verse, and contains upward of 10,000 lines and is filled with the most absurd fables. Numerous manuscripts prove its popularity. These are found in the Bodleian, Cottonian, Herald's College, and other libraries. Thomas Hearne printed it at Oxford in 1724, but the best edition is that of Aldis Wright in the Rolls series (two vols. 1887). It is partly based on earlier works, is wholly destitute of originality and some have thought it a translation from the French.

**ROBERT GUISCARD,** gēs'kär, THE RESOURCEFUL, Norman-Italian soldier and noble, b. near Contances, Normandy, c. 1015; d. Cephalonia, Greece, 15 July 1085. His father was Tancred of Hauteville. His brothers William of the Iron Arm, Dgo and Hemphrey having gained distinction in Italy, Robert who had developed into a strikingly handsome man, tall and blonde, with a dominating voice, as described by Anna Comnena, in 1046, in his 30th year followed them, but was not warmly welcomed. He, however, soon became a leader of men during the tumultuous period of reconstruction then being attempted in Italy. In 1057 he succeeded his brother Humphrey as Count of Apulia, and while their brother Richard conquered Capua, Robert with his youngest brother Roger completed the conquest of Apulia and Calabria. Previously looked on with disfavor by the papal authorities, in 1059 Pope Nicholas II concluded a treaty with Robert creating him Duke of Apulia and Calabria and Lord of Sicily provisionally, on the conquest of the island. This, however, was not accomplished until 1090, five years after the death of Robert. He incurred excommunication in 1074 for attacking Benevento, a papal possession, but in 1080 was reconciled to Pope Gregory VII, who needed his assistance against Henry IV. Having become master of southern territorial Italy, in 1081 he embarked on a victorious campaign in the Balkan Peninsula against the Greek Byzantine Empire, championing the cause of Michael VII, who had been deposed by Alexius Comnenus, and whose son was his prospective son-in-law. In 1083 he was recalled to the aid of Pope Gregory VII, besieged by Henry IV in the castle of Sant' Angelo, Rome. He raised the siege, quelled a revolt of the citizens by a three days' sack of the city in May 1084, and re-established the Papacy. Returning to the Greek campaign he died of fever in the following year at Cephalonia and was buried at Venosa. Consult Amatus, 'Ystoire de li Normani' (ed. by Delarc, Rouen 1892); Chalandon, F., 'Histoire de la domination normande en Italie et en Sicile' (Paris 1907); Comnena, A., 'Corpus scriptores historicæ Byzant' (Bonn 1839); Heinneman, L. v., 'Geschichte der Normannen in Unteritalien und Sizilien' (Leipzig 1894).

**ROBERT OF MOLESME,** mō-lām, Saint, founder of the Cistercians: b. Champagne, 1018; d. Molesme, 1110. At 15 he became a Benedictine monk in the abbey of Montier-la-Celle, where on account of his high and religious character he was elected prior while still the youngest member of the community. He was afterward appointed abbot of Saint Michael de Tonnerre. He was induced to leave this abbey through the recalcitrancy of the monks. In Colan, however, a desert place near the abbey, there lived certain anchorites, and at their request he became their superior; they thence removed to the forest of Molesme, where they built themselves cells and an oratory dedicated to the Holy Trinity (1075). Here the community became relaxed in discipline through the bounteous contributions proved by the bishop of Troyes and others. Robert, therefore, left them and eventually settled with some devout members of the abandoned community at a place called Cistertium, or Citeaux, five leagues from Dijon in the diocese of Chalons. They chose a spot in the uninhabited forest with the consent of Walter, bishop of Chalons, and Renand, viscount of Beaune, lords of the territory. The day of their establishment was Saint Bennet's Day, 21 March 1098, from which must be dated the foundation of the Cistercian Order. The rule established by Saint Robert allotted four hours for sleep, four for singing the offices, four for manual labor and four for study. Thus was the great, practical and highly useful Cistercian Order founded; and it was presided over by Abbot Robert until his death.

**ROBERTS, Benjamin Stone,** American soldier: b. Manchester, Vt., 1811; d. Washington, D. C., 29 Jan. 1875. He was graduated from West Point in 1835, and in 1839 became chief engineer in the construction of the Champlain and Ogdensburg Railroad. He was assistant geologist of New York State in 1841, and in 1843 was admitted to the bar and engaged in law practice. At the outbreak of the Mexican War he re-entered the army with rank as lieutenant. He served at Vera Cruz, Cerro Gordo, Contreras, Churubusco, Matamoras and the Galajara pass, was promoted captain, received brevet rank of lieutenant-colonel, and at the close of the war was voted a sword of honor by the Iowa legislature. In 1861 he was commissioned brigadier-general of volunteers and served under General Pope as chief of cavalry in the Army of Virginia. He was present at Cedar Mountain and the second battle of Bull Run and at the close of the war was brevetted brigadier-general in the regular army. In 1866 he became lieutenant-colonel of cavalry and in 1868 accepted the chair of military science at Yale which he occupied until his retirement in 1870. He was the inventor of the Roberts breech-loading rifle.

**ROBERTS, Benjamin Titus,** American Methodist clergyman: b. Leon, Cattaraugus County, N. Y., 1823; d. Chili, N. Y.. 27 Feb. 1893. He was graduated at Wesleyan University in 1848, joined the Genesee Conference of the Methodist Episcopal Church, but in 1860 was one of the seceders from that body who founded the Free Methodist sect, of which he became the first general superintendent. In the same year he began a monthly magazine called *The Earnest Christian*, and in 1865 founded the Cheeseborough Academy at North Chili, N. Y., serving as its president from 1869 until his death. He wrote 'Fishers of Men'; 'Why Another Sect'; 'First Lesson in Money'; 'Ordaining Women.'

**ROBERTS, Brigham Henry,** American journalist and politician: b. Warrington, Lancashire, England, 13 March 1857. In the summer of 1866 he emigrated with his parents to

Davis County, Utah. In 1878 he was graduated from the University of Utah, and soon afterward was called by the Mormon Church to its missionary service. After laboring for some years as a missionary he was elected to a high office in the church. He also engaged in journalism and was editor-in-chief of the Salt Lake *Herald*. In 1895 he was a member of the State constitutional convention. At the first State election he was the Democratic nominee for Representative to Congress, but was defeated. In 1898, however, he was elected by a large majority. His election created widespread agitation throughout the country, and on 25 Jan. 1900 the House of Representatives by an overwhelming majority voted to exclude him as constitutionally ineligible, as a polygamist, to a seat in that body. He is the author of 'The Gospel' (1888); 'Life of John Taylor' (1892); 'Outlines of Ecclesiastical History' (1893); 'Succession in the Presidency of the Church' (1893); 'A New Witness for God' (1895); 'Missouri Persecutions' (1900); 'The Rise and Fall of Nauvoo' (1900); 'Mormon Doctrine of Deity' (1903); 'Defense of the Faith and the Saints' (2 vols. 1905). He also edited numerous volumes of Mormon Church history.

**ROBERTS, Charles George Douglas,** Canadian author: b. Douglas, near Fredericton, New Brunswick, 10 Jan. 1860. He was educated at the University of New Brunswick, in 1883–84 was editor of the Toronto *Week;* in 1885–87 was professor of English and French literature in King's College (Windsor, N. S.); and was professor of economics and international law from 1887 until his resignation in 1895, since when he has lived in New York. His reputation was first made as a poet with a gift of melody, a clear and grave manner, and a particular felicity, noticeable in the Canadian school, in pictures of nature. Later, he became equally known for his prose work in 'The Heart of the Ancient Wood' (1900), and 'The Kindred of the Wild' (1902), the latter one of the most successful of imaginative treatments of wilderness life. The collection of short stories, 'Earth's Enigmas' (1896), also is marked by an interesting individual quality. Among Roberts' other volumes are 'In Divers Tones' (1887); 'Ave: An Ode for the Shelley Centenary' (1892); 'Songs of the Common Day' (1893); 'The Raid from Beausejour' (1894); 'A History of Canada' (1897); 'The Book of the Native' (1897); 'The Forge in the Forest' (1897); 'By the Marshes of Minas' (1900); 'The Book of the Rose' (1903).

**ROBERTS, David,** English painter: b. Edinburgh, 24 Oct. 1796; d. London, 25 Nov. 1864. In 1818 from being a house painter he advanced to the profession of scene painter, and in 1821 painted scenery for the stage of Drury Lane, London. All this while he was studying drawing and oil painting, and in 1826 and 1827 he attracted attention by his pictures of Rouen and Amiens cathedrals. Later on he traveled in Spain, Morocco, Egypt, Palestine, Italy, Belgium, making drawings of great buildings and landscapes with picturesque edifices, and working them up into pictures. Among his works the following are the most noteworthy: the drawings from Spain for the 'Landscape Annual' (1835–38), and illustrations for the volume entitled 'The Holy Land, Syria, Idumea, Arabia, Egypt, and Nubia' (1842). His other pictures represent numerous interiors of churches; as Saint Miguel at Xeres, Holy Nativity at Bethlehem, Saint Jean at Caen, Saint Paul at Antwerp, Saint Peter's at Rome, the cathedrals of Milan and Seville. Among his religious historic pictures are 'Departure of the Israelites from Egypt' (1829); 'Ruins of the Great Temple at Karnac' (1845); 'Destruction of Jerusalem' (1849), which were followed by 'Rome' (1855), and 'Grand Canal at Venice' (1856). Roberts' style was essentially spectacular; he produced grand, broad effects, with magnificent architectural arrangements, to which the details are of course generally sacrificed.

**ROBERTS, Edmund Quincy,** American diplomat: b. Portsmouth, N. H., 29 June 1784; d. Macao, China, 12 June 1836. He engaged in a mercantile career at 13, lived in Buenos Aires and afterward in London and had gained considerable shipping interests when he returned to the United States at the age of 24. He arranged preliminary negotiations with the sultan of Zanzibar in 1827, resulting in friendly relations and a satisfactory treaty with the United States, and in 1832 was sent to Muscat, Siam and Cochin-China as a special diplomatic agent to secure commercial treaties. He returned in 1834 and in 1835 was sent on a similar mission to Japan, but died en route. Author of 'Embassy to the Eastern Courts' (1837). Consult Ruschenberger, W. S. W., 'A Voyage Around the World, Including an Embassy to Muscat and Siam' (1838).

**ROBERTS, Edwin Ewing,** American politician: b. Pleasant Grove, Cal., 12 Dec. 1870. In 1890 he was graduated at the California School of Elocution and Oratory, San José, and in 1891 at the State Normal School of San José. In 1891–99 he taught school, was admitted to the bar in 1899 and has since been practising at Carson City, Nev. He served five terms as district attorney of Ormsby County, Nev., in 1900–08, and in 1911–19 was member of the 62d to the 65th congresses. In 1918 Mr. Roberts was Republican choice for United States Senator from Nevada.

**ROBERTS, Ellis Henry,** American financier: b. Utica, N. Y., 30 Sept. 1827; d. 8 Jan. 1918. He was graduated from Yale in 1850 and in 1851 became editor and proprietor of the Utica *Morning Herald*. He sat in the State legislature in 1867, was a member of Congress 1871–75, afterward continuing his editorial work until 1889, when he was appointed assistant treasurer of the United States. In 1893–97 he was president of the Franklin National Bank in New York, and after 1897 was United States treasurer. He published 'Government Revenues' (1884); 'The Planting and Growth of the Empire State' (1887).

**ROBERTS, George Evan,** American authority on finance and director of the United States mint: b. Delaware County, Iowa, 19 Aug. 1857. He was educated in the public schools and in 1878–1909 was proprietor of the Fort Dodge *Messenger*. He was State printer of Iowa in 1882–89, and was director of the United States mint in 1898–1907 and 1910–14. He has since been assistant to the president of the National City Bank of New York. Author of ‹Coin at School in Finance› (1895); ‹Iowa and the Silver Question› (1896); ‹Money, Wages and Prices› (1897); ‹Business After the War› (1916), etc.

**ROBERTS, Howard,** American sculptor: b. Philadelphia, 1843; d. Paris, 19 April 1900. He studied at the Pennsylvania Academy of Fine Arts and in 1866 went to Paris and studied under Dumont and Gumery at the École des Beaux Arts. In 1875 he established a studio in Philadelphia and at the Centennial Exhibition exhibited a statue, ‹La Première Pose,› that created a sensation on account of its superior technical qualities. He received one of the three medals awarded to American sculptors. Other works are ‹Eleanor›; ‹Hester Prynne›; ‹Hypatia›; ‹Lot's Wife,› nearly all being at the Pennsylvania Academy.

**ROBERTS, Isaac Phillips,** American agriculturist and educator: b. Seneca County, N. Y., 24 July 1833. After several years' connection with the agricultural department of the State College of Iowa he became connected with Cornell University. He was professor of agriculture and dean of the faculty of agricultrue there in 1873–94; director of the agricultural experiment station in 1888–1903, and professor emeritus and lecturer on agriculture from 1903. He was for many years assistant editor of *The Country Gentleman;* wrote about 1,200 articles for agricultural papers, and was also author of ‹The Fertility of Land› (1898); ‹The Farmstead› (1900); ‹The Farmers' Business Handbook› (1903); ‹The Horse› (1905); ‹The Autobiography of a Farm Boy› (1916).

**ROBERTS, John Bingham,** American surgeon and author: b. Philadelphia, Pa., 29 Feb. 1852. He was graduated at the University of Pennsylvania in 1871, received the degree of A.M. in 1874, and that of M.D. at Jefferson Medical College in 1874. He was formerly attending physician and lecturer on clinical medicine at Jefferson Medical College Hospital; was president of the Philadelphia County Medical Society, also of the Medical Society of the State of Pennsylvania, Philadelphia Academy of Surgery, Philadelphia Polyclinic and College for Graduates in Medicine, American Academy of Medicine, and section on anatomy of the first pan-American Medical Congress; and former vice-president of the Pathological Society of Philadelphia and of the American Surgical Association. Dr. Roberts is treasurer of the College of Physicians of Philadelphia; Fellow of the American Association for Advancement of Science, the American Medical Association and membre original de la Société internationale de chirurgie. He was formerly lecturer on anatomy and surgery in the Philadelphia School of Anatomy; lecturer on anatomy, University of Pennsylvania; professor of surgery in the Woman's Medical College of Pennsylvania; Muetter lecturer on pathology of the College of Physicians of Philadelphia, and surgeon to various hospitals in Philadelphia. He is professor of surgery in the Philadelphia Polyclinic and College for Graduates in Medicine. Dr. Roberts has published ‹Paracentesis of Pericardium› (1880); ‹Compend of Anatomy› (1881); ‹Surgical Delusions and Follies› (1884); ‹Treatise on Modern Surgery› (1890); ‹Modern Medicine and Homœopathy› (1895); ‹Fracture of Radius› (1897); ‹Surgery of Human Brain› (1897); ‹Notes on Modern Treatment of Fractures› (1898); ‹Deformities of Face› (1900); ‹The Doctor's Duty to the State› (1908); ‹Surgery of the Face› (1912); ‹Treatise on Fractures,› with James A. Kelly (1916). He has contributed articles to systems and encyclopædias of medicine and surgery (Bryant, Holmes, Ashhurst, Dennis, Pepper, Keen) and *Transactions* of the American Surgical Association and other periodicals.

**ROBERTS, Morley,** English novelist and journalist: b. London, 29 Dec. 1857. After study at Owens College, Manchester, he went, in 1874, to Australia, and there worked on railways in Victoria and as a sheep and cattle rancher in the New South Wales bush. Then he was before the mast in merchant ships, and after some experience in the quartermaster-general's department of the British war office and in the India office, set out again traveling, visiting in 1884–86 many of the western United States, Canada, British Columbia and Manitoba, and later the South Seas. His hardships and adventures have lent a certain element of vigor to his stories, which are better known in England than in the United States and include ‹King Billy of Ballarat› (1891); ‹The Reputation of George Saxon› (1892); ‹Red Earth› (1894); ‹The Degradation of Geoffrey Alwith› (1895); ‹The Great Jester› (1896); ‹The Circassian› (1896; with Max Montesole), an interesting book of Eastern life; ‹The Keeper of the Waters› (1898); ‹The Colossus› (1899), which, as giving a portrait of Cecil Rhodes (q.v.), was perhaps most talked of among Roberts' works; ‹Immortal Youth› (1902); ‹The Way of a Man› (1902); ‹The Promotion of the Admiral› (1903); ‹Bianca's Caprice› (1904); ‹Lady Penelope› (1905); ‹Captain Baalaam› (1905); ‹The Idlers› (1905); ‹The Prey of the Strongest› (1906); ‹The Blue Peter› (1907); ‹The Flying Cloud› (1907); ‹Lady Anne› (1907); ‹Captain Spink› (1908); ‹David Bran› (1908); ‹Midsummer Madness› (1909); ‹Sea Dogs› (1910); ‹The Wonderful Bishop› (1910); ‹Thorpe's Way›; ‹Four Plays› (1911); ‹The Man who Stroked Cats›; ‹The Private Life of Henry Maitland› (1912); ‹Gloomy Fanny› (1913); ‹Time and Thomas Waring›; ‹Sweet Herbs and Bitter› (1914).

**ROBERTS, Oran Milo,** American jurist and governor of Texas: b. Laurens District, S. C., 9 July 1815; d. Austin, Tex., 19 May 1898. He was graduated at the University of Alabama in 1836, was admitted to the bar in 1837 and engaged in practice. He served in the State legislature in 1839–40, and in 1841 removed to Texas. He became district attorney in 1844, and after Texas' admission to the United States was district judge in 1846–51. He was associate justice of the Supreme Court of Texas in 1857–61. He served in the Confederate army in 1862–64, and was then appointed chief justice of the Supreme Court of Texas. He was elected to the United States Senate in 1866, but was not permitted to take his seat. He was again chief justice of the Texas Supreme Court in 1874–79; was governor of Texas in 1879–83, and was subsequently professor of law at the University of Texas. Author of ‹Governor Roberts' Texas› (1881).

**ROBERTS, Robert Richford,** American Methodist bishop: b. Frederick County, Md., 2 Aug. 1778; d. Lawrence County, Ind., 26 March 1843. He removed with his family in 1785 to Ligonier Valley, western Pennsylvania, and was brought up on the frontier. He obtained Methodist books, studied for the ministry, in 1802 was licensed to preach, served as an itinerant preacher for several years, and later was in charge of important pastorates in Baltimore and other cities. In 1816 he was elected bishop and soon after removed to Indiana. He did much for Indian missions, and among the Indians he was known as «the grandfather of all the missionaries.» Consult Charles Eliot, ‹Life of Bishop Roberts› (1853).

**ROBERTS, William Henry,** American Presbyterian clergyman: b. Holyhead, Wales, 31 Jan. 1844. He was graduated at the College of the City of New York in 1863; at Princeton Theological Seminary in 1873; and was ordained in 1873. He was statistician of the Treasury Department at Washington, D. C., in 1863–65, and assistant librarian of Congress in 1866–71. He was pastor at Cranford, N. J., in 1873–77; librarian at the Princeton Theological Seminary in 1878–86; and professor of practical theology at Lane Theological Seminary, Cincinnati, Ohio, in 1886–93. In 1895–1900 he was acting pastor at Fourth Church, Trenton, N. J. He occupied many important church organization offices, was moderator of the general assembly in 1907, and as its secretary edited its minutes in 1884–1914. Author of ‹History of the Presbyterian Church› (1888); ‹Laws Relating to Religious Corporations› (1896); ‹Manual for Ruling Elders› (1897), etc.

**ROBERTS, William Milnor,** American civil engineer: b. Philadelphia, 12 Feb. 1810; d. Brazil, South America, 14 July 1881. As early as 1831 he was senior principal assistant engineer on the Allegheny Portage Railroad, and in 1835 he planned and built across the Susquehanna River at Harrisburg the first combined railroad and highway bridge in the United States. During the next 20 years he was engineer or contractor on many American railroads and canals. In 1857 he went to Brazil and undertook the construction of the Dom Pedro II Railroad. During 1866–68 he was United States civil engineer in charge of improvements of the Ohio River; from 1868–70 associate contractor with James B. Eads in building the bridge across the Missouri at Saint Louis. In 1870 he became chief engineer of the Northern Pacific Railroad, and in 1874 visited Europe on an observation tour of jetties as member of the commission of civil and military engineers to report on plans for the improvement of the mouth of the Mississippi River. In 1879 the emperor of Brazil appointed him on a commmission of hydraulic engineers to report on harbors and rivers of Brazil, and in prosecution of these labors he died of a fever. He was president of the American Society of Civil Engineers in 1879.

**ROBERTS OF KANDAHAR, PRETORIA AND WATERFORD, Frederick Sleigh,** 1st Earl, British soldier: b. Cawnpore, India, 30 Sept. 1832; d. Saint Omer, France, 14 Nov. 1914. Son of General Sir Abraham Roberts; he was educated at Eton, Sandhurst and Addiscombe; and was commissioned second lieutenant, Bengal artillery in 1851. At the outbreak of the Indian mutiny he was deputy assistant quartermaster-general, and fought at the siege and capture of Delhi and at the second relief of Lucknow. He won the Victoria Cross at the action of Kali Nadi by recovering, single-handed, a standard with which some sepoys were making off. In 1863 he was employed in the Umbeyla campaign, and four years later accompanied the Bengal brigade to Abyssinia under Gen. Donald Stewart. For his services he was made brevet lieutenant-colonel, and in 1871 became a C.B., after serving with the Lushai expeditionary force. When in 1878 the war with Afghanistan broke out, he was placed in command of the Kurram field force. At the close of the first phase of the war Roberts was awarded the thanks of both houses of Parliament and made a K.C.B. Then came the Kabul massacre. The Indian government was unprepared; the force under Roberts was the only one in a position to strike for Kabul. He successfully fought his way through and spent several months of continual fighting around Sherpur. . Eventually matters quieted down and the war was considered over when in July 1880 Ayub Khan defeated General Burrows' brigade at Maiwand and besieged General Primrose in Kandahar. Helplessness seized the British government, but Roberts saved the situation. He set out with fewer than 10,000 men on the 313 miles' journey from Kabul to Kandahar. It was a daring and highly risky undertaking to lead such a small force through a wild and hostile country without a base of operations or communications of any kind, and toward a point presumably already in the hands of the enemy. For four weeks the world heard nothing of Roberts and his column. They reached Kandahar, raised the siege and completely defeated Ayub Khan with a loss of 2,000 men, whilst the British losses amounted to only 248 killed and wounded. Again he received the thanks of Parliament and was created a baronet. His next post was that of commander-in-chief in Madras. The Majuba Hill disaster occurred 27 Feb. 1881 and Britain once more turned to General Roberts to retrieve its fortunes. He was sent to South Africa, but only remained there 24 hours, peace having been concluded in the meantime. In 1885 he was appointed commander-in-chief in India, and shortly after took charge of the final operations in the Burma War. The next seven years, though years of peace, brought no rest to the strenuous soldier. He built fortifications, strengthened and safeguarded the frontiers, prepared defense schemes, established regimental institutes, introduced skilled nursing in the military hospitals, improved the shooting of British as well as native troops, and devised many other benefits which have permanently written his name over the Indian Empire. In 1893 he completed 41 years' service in India. After a spell of rest Lord Roberts took command of the forces in Ireland, and it seemed that his fighting days were over. Perhaps he himself wished it, for 44 years of toil and hardship under foreign skies had left their mark upon him. He had behind him a career and a reputation that the most ambitious might envy, but fate demanded that his life's work should be crowned by yet another effort — perhaps his greatest. To the old soldier it was a crown more of sorrow than glory. His only son fell fighting at Colenso, 16 days after winning the Victoria Cross. In his 68th year Lord Roberts responded once more to his country's call; the eyes of the British Empire turned instinctively to the one man who, in their estimation, was the man to redeem the melancholy blunders and disasters of the South African War. Nor were their hopes disappointed. He returned to England in 1900, after the capture of Pretoria and Bloemfontein, leaving Lord Kitchener to continue and wind up the guerrilla fighting. Roberts was then appointed commander-in-chief of the British army, made an Earl and a K.G., and was formally thanked for his services by King Edward VII. Parliament also voted him a grant of $500,000. He served in his new command until its abolition in 1904, when he retired The last 10 years of his life were devoted to exhorting his countrymen to place their great heritage in such a condition of strength and preparedness that they might be able to regard the unknown future with that confidence born of timely sacrifice and prudent foresight. He was fully aware of Germany's designs and preparations for a war of world domination, but to a large extent his voice fell on deaf ears. In November 1914 he died while on a visit to the British line, resisting the German invasion of France. He was given a public funeral in Saint Paul's Cathedral. The earldom descended, by special remainder, to his daughters and their issue. Lord Roberts published ‹The Rise of Wellington› (1895); ‹Forty-one Years in India› (1897; new ed., 1915). Consult Cobban, J. M., ‹The Life and Deeds of Earl Roberts› (4 vols., London 1901); Forrest, Sir George, ‹The Life of Lord Roberts› (New York 1914); Menpes, M., ‹Lord Roberts› (New York 1915); Vickers, Roy, ‹Lord Roberts: The Story of His Life› (London 1914).

**ROBERTSON, Archibald Thomas,** American Baptist theologian: b. near Chatham, Va., 6 Nov. 1863. He was educated at the Southern Baptist Theological Seminary; became associated with its teaching staff in 1888, and since 1895 has been professor of theological interpretation there. Author of ‹Syllabus of New Testament Syntax› (1900); ‹Short Grammar of the New Testament› (1908); ‹The Glory of the Ministry› (1911); ‹Practical and Social Aspects of Christianity› (1915); Studies in the New Testament› (1915).

**ROBERTSON, Frederick William,** English clergyman: b. London, 3 Feb. 1816; d. Brighton, 15 Aug. 1853. He was ordained in 1840, and was graduated from Brasenose College, Oxford, in 1841; in that year he was made curate of Christ Church, Cheltenham; and from 1847 until his death was pastor of Trinity Chapel, Brighton. His eloquence was remarkable, and soon extended his renown far beyond local limits. He was an eclectic in theology, and declared for no party in a time when the clergy were generally partisans. His frequent dissent from various positions of the schools of thought brought upon him numerous attacks, whose importance he was wont to overestimate. His views were colored by study of the Germans, and developed considerably during the progress of his ministry. His mind was positive, original and without fear; and his constant labor greatly affected his health. He was deeply interested in the workingmen's institute, which he founded at Brighton, and whose work he made very effective. His ‹Sermons› (1855–90), though derived from inadequate shorthand notes or from recollections prepared by himself, have been very widely read. His other important work has been collected in his ‹Literary Remains.› Consult the ‹Life and Letters› by S. A. Brooke (1865).

**ROBERTSON, James,** English royal governor of New York: b. Fifeshire, Scotland, about 1720; d. London, England, 4 March 1788. He entered the army and after various services sailed for America in 1756, was appointed major-general of the royal troops raised in America and barrack-master at New York. He commanded a brigade at the battle of Long Island in 1776 and after André's capture made an earnest effort to secure his release. In 1779 he was appointed royal governor of New York, and in 1782 received rank as lieutenant-general. He returned to England in the following year. His reputation was that of an avaricious and supercilious officer and in his position as governor he was charged with arbitrary measures.

**ROBERTSON, James,** American pioneer: b. Brunswick County, Va., 28 June 1742; d. Chickasaw region, Tenn., 1 Sept. 1814. In 1769 he accompanied Daniel Boone (q.v.) on the latter's third exploration, and stopping at Watauga (now Elizabethton, Tenn.), planted corn. In 1770 he returned thither with a band of North Carolinian settlers. The settlement soon numbered some 200. Both North Carolina and Virginia asserted jurisdiction over it, but neither colony offered protection; and it was left an independent outpost of civilization. With John Sevier, Robertson became the head of the communities which gathered about the Holston and Watauga. In 1777 he was commissioned agent of North Carolina among the Cherokees, and during his residence of more than a year thwarted the British agent and kept at peace the great body of Cherokees and Creeks. With a party of settlers he set out in 1779 for the French Lick of the Cumberland, and on 25 December made the beginnings of a town on the site of Nashville, then 15 days' journey from the westernmost white confines. A fort built, a military organization was made, with Robertson as colonel. Troubles increased. Provisions were low, and the Indians hostile. He detached the Chickasaws and Choctaws from their English alliance and concluded a treaty with the Cherokees. He also defended the settlement against the Creeks, who were abetted by the Spanish authorities of Louisiana; and refused to organize a separate state in alliance with Spain. In 1790 Robertson was commissioned United States brigadier-general, and latterly he was government Indian agent. He was well fitted for his frontier career, and especially successful in his dealings with the savages. His favorite saying, «Man proposes, but God disposes,» he always insisted was somewhere in the Book of Job. Consult the ‹Life› by Putnam (1859); Gilmore, ‹The Rear Guard of the Revolution› (1886), and *Harper's Magazine,* February 1888, pp. 420–426.

**ROBERTSON, James,** Canadian Presbyterian clergyman: b. Dull, Scotland, 24 April 1839; d. Toronto, Canada, 4 Jan. 1902. He removed to Canada with his family in 1855, and was educated at the University of Toronto, the Princeton Theological Seminary and the Union Theological Seminary, New York. He was pastor at Norwich, Windham and East Oxford, Ontario, in 1869–74, and of Knox Church, Winnipeg, in 1874–81; and was lecturer at Manitoba College, Winnipeg, from 1877. In 1881 he was appointed superintendent of Presbyterian missions for Manitoba and the North West Territory, and achieved a high reputation as an organizer of ability and courage in dealing with the problems of his missions in the wilderness. He was the «sky pilot» of Ralph Connor's (q.v.) tales. He was moderator of the general assembly in 1895.

**ROBERTSON, James Burton,** English historian: b. London, 15 Nov. 1800; d. Dublin, 14 Feb. 1877. He was educated at the Roman Catholic College of Saint Edmund, near Ware, and was called to the bar in 1825. Later he studied literature, philosophy and dogmatic theology in France. His first important publication was a translation of Frederick Schlegel's 'Philosophy of History' (1835). He lived in Germany in 1851–54, and here produced a translation of Möhler's 'Symbolism or Exposition of Doctrinal Differences Between Catholics and Protestants' (1843), a work which made a deep impression on the Tractarians. In 1855 J. H. Newman, then rector of the Catholic University at Dublin, called him to the chair of geography and modern history and later the department of English literature was assigned him. His original works comprise lectures 'On Subjects of Ancient and Modern History' (1859); 'On Subjects of Modern History and Biography' (1864); on the 'Writings of Chateaubriand, and on the Illuminati, Jacobins and Socialists'; 'On the Life, Writings and Times of Edmund Burke' (1869), together with poetry and translations.

**ROBERTSON, James Craigie,** Scottish clergyman: b. Aberdeen, Scotland, 1813; d. Canterbury, England, 9 July 1882. He was graduated from Cambridge in 1834, and took orders in the Anglican Church in 1836. He was made canon of Canterbury in 1859, and from 1867–74 was professor of ecclesiastical history at King's College, London. He published 'How Shall We Conform to the Liturgy' (1843); 'Church History' (1852–73); 'Plain Lectures on the Growth of Papal Power' (1876); edited Heylyn's 'History of the Reformation' (1849); 'Materials for the History of Archbishop Thomas Becket' (1875–82), etc.

**ROBERTSON, James Wilson,** Canadian agriculturist and educator: b. Dunlop, Ayrshire, Scotland, 2 Nov. 1857. He removed with his parents to Canada in 1875, was engaged in farming and cheese manufacture, and was professor of agriculture at the Ontario Agricultural College in 1886–90. He was appointed as the first dairy commissioner for the Dominion in 1890, and was the first commissioner of agriculture and dairying in 1895–1904. He was principal of the Macdonald College at Saint Anne de Bellevue, Quebec, in 1905–09; and from 1910 was chairman of the Royal Commission on Industrial Training and Technical Education, and of the committee on lands of the Canadian commission of conservation. Author of 'Conservation of Life in Rural Districts' (1911).

**ROBERTSON, John Mackinnon,** British author, lecturer and legislator: b. Brodick, Isle of Arran, 14 Nov. 1856. He received an elementary education at Stirling, Scotland, but left school at the age of 13 years. In 1878 he joined the staff of The Edinburgh *Evening News,* as a leader writer, went to London in 1884 to join the staff of Bradlaugh's *National Reformer,* and was the editor of that publication from the time of Mr. Bradlaugh's death in 1891 until it went out of existence in 1893. Mr. Robertson then started *The Free Review* and was editor of that periodical until 1895. In that year he was the Independent Radical candidate for Parliament for Northampton, but was not elected. He made a lecturing tour in the United States during 1897–98, and in June 1900 he went to South Africa to investigate the condition of affairs in Cape Colony and Natal. His letters from South Africa to *The Morning Leader,* signed «Scrutator,» attracted a great deal of attention at the time. He has been member of Parliament for the Tyneside Division of Northumberland since 1906, and was named a Privy Councilor in 1915. He was Parliamentary Secretary to the Board of Trade from 1911 to 1915. He has written a number of books and essays on religious and literary subjects, among which are 'The Dynamics of Religion'; 'Modern Humanists'; 'Buckle and His Critics'; 'History of Free Thought'; 'Christianity and Mythology'; 'Montaigne and Shakespeare'; 'The Baconian Heresy' and 'The Eight Hours Question.'

**ROBERTSON, John Ross,** Canadian journalist: b. Toronto, 28 Dec. 1844. He was educated at Upper Canada College, where in 1859 he founded the *Upper Canada College Times.* He afterward engaged in journalism, published 'Robertson's Railway Guide,' the first of its kind issued in Canada, and in 1864 he became city editor of the Toronto *Globe.* He founded the *Evening Telegraph* in 1866 and made it a leading Conservative organ. In 1872–75 he was London agent of the Toronto *Daily Globe,* then returned to Canada, and was managing editor of the *Nation.* He founded the Toronto *Daily Telegram* in 1876, acting as its editor and publisher as well as owner, and made it one of the leading Canadian publications of its type. He was one of the founders of the Lakeside Home for Little Children in 1883, as well as the Hospital for Sick Children. He was elected to the Canadian Parliament in 1896. Author of 'History of Craft and Capitular Masonry in Canada' (1888); 'History of Cryptic, Templar and A. and A. S. Rite Masonry in Canada' (1888); 'Robertson's Landmarks of Toronto' (5 vols., 1905), and editor of 'Diary of Mrs. John Graves Simcoe' (1911).

**ROBERTSON, Morgan,** sailor, watchmaker, diamond setter, inventor and sea-story writer: b. in Oswego, N. Y., 30 Sept. 1861; d. 4 March 1915. Young Robertson ran away to sea at the age of 16 before he finished his public school education. In 1886 he left the sea and took up the watch-maker's trade. About 1894 he began to write. His best-known books are 'Spun Yarn' (Harper's 1898); 'Where Angels Fear to Tread,' (1899); 'Masters of Men' (1901); 'Shipmates' (1901); 'Down to the Sea' (1905); 'Land Ho' (1905);

‹Sinful Peck› (1903). He invented a periscope for submarines, which was the outgrowth of a fiction story. He died suddenly 4 March 1915. A uniform edition of his stories was brought out in 1915.

**ROBERTSON, Thomas William,** English actor and dramatist: b. Newark-on-Trent, 9 Jan. 1829; d. London, 3 Feb. 1871. He came of a theatrical family and played his first part at the age of four. He had a varied career as actor, newspaper writer, adapter of plays, as well as dramatist, in none being more than successful enough to gain a bare subsistence until he wrote ‹David Garrick,› produced by E. A. Sothern in 1864. This piece has taken a permanent place on the English stage. Following this a play called ‹Society› had a long and successful run, making the fortunes of the Prince of Wales Theatre and the author. At the same house were produced his most successful series of plays, including ‹Ours,› ‹Caste,› ‹Play,› ‹School,› and ‹M. P.› Some of these, especially ‹Caste,› his masterpiece, are revived from time to time. His comedy was artificial, with a strong sentimental interest; but he was a good observer of manners and drew his characters from life. He established a distinct school, and has had several followers, though in the best exponents of the later English dramas he has been replaced by writers whose methods are less artificial and hence more logical. His ‹Principal Dramatic Works› were published with a memoir by his son in 1889. Consult also Pemberton, ‹Life and Writings of T. W. Robertson› (1893); Cook, ‹Nights at the Play› (1883); Clement Scott, ‹The Drama of Yesterday and To-day› (1899).

**ROBERTSON, William,** Scottish historian: b. Borthwick, Midlothian, 19 Sept. 1721; d. near Edinburgh, 11 June 1793. After the completion of his course in Edinburgh University, Robertson obtained a license to preach in 1741, and in 1743 was presented to the living of Gladsmuir, in East Lothian. His ‹History of Scotland During the Reigns of Queen Mary and King James VI› appeared in 1759, and was received with general applause, though modern research has deprived it of most of its historical value. This work, which reached a 14th edition before the author's death, led to his nomination to the chaplaincy of Stirling Castle in 1759, as one of the king's chaplains in 1761, and as principal of the University of Edinburgh in 1762. The year after he was made historiographer-royal of Scotland, with a salary of £200 per annum. His ‹History of the Reign of Charles V› appeared in 1769, and his ‹History of America› in 1777. His latest work appeared in 1791, under the title of a ‹Historical Disquisition Concerning the Knowledge which the Ancients Had of India, and the Progress of Trade with that Country Prior to the Discovery of the Cape of Good Hope.› Consult ‹An Account of the Life and Writings of William Roberston› (1801–02); Gleig, ‹Life and Writings of William Robertson› (1812); Graham, ‹Scottish Men of Letters in the 18th Century› (1901).

**ROBERTSON, William H.,** American jurist and politician: b. Bedford, N. Y., 10 Oct. 1823; d. Katonah, N. Y., 6 Dec. 1898. He was admitted to the bar in 1847 and engaged in practice in his native town. He served three terms in the State assembly and eight terms in the State senate between the years 1848–91,; and was county judge of Westchester County in 1854–66. He was a member of the 40th Congress, 1867–69. In March, 1881 he was appointed collector of customs for the port of New York by President Garfield, an appointment which met with the determined opposition of Senators Conkling and Platt, of New York, who considered the nomination their political prerogative. The President refused to withdraw the name of Judge Roberston and the two Senators resigned and appealed to the legislature of New York to re-elect them as a rebuke to the President; but the legislature refused to support them and elected other members in their places. The controversy assumed a bitter aspect and resulted in a party split. Robertson's appointment was confirmed by the Senate and he remained in office until the close of President Arthur's term in 1885.

**ROBERTSON, Sir William Robert,** English general: b. 1860. He began his military career as a lieutenant in the 3d Dragoon Guards in 1888 and served as railway transport officer in the Miranzai and Black mountains expeditions in 1891. He was staff captain and deputy-assistant-quartermaster-general in the Intelligence Branch at Simla (India) 1892–96, and intelligence officer with the Chitral Relief Force in 1895, when he was treacherously attacked and left for dead by his native escort. After serving at the War Office he went to South Africa in 1900 and later became Assistant Director of Military Operations at the War Office until 1907. From 1907 to 1910 he was brigadier-general of the General Staff at Aldershot and commandant of the Staff College 1910–13. At the outbreak of the European War he accompanied the Expeditionary Force as quartermaster-general and was specially commended for his services during the retreat from Mons. In 1916 he became chief of the Imperial General Staff and a member of the Army Council. He resigned from the former in February 1918 and was appointed to the chief command of the forces in Great Britain in June 1918.

**ROBERTSON, William Schenck,** educator and mission superintendent: b. Huntington, L. I., 11 Jan. 1820; d. 26 June 1881. He was fitted for college at several different academies and graduated from Union College, Schenectady, in 1843. He started to study medicine but, after partially completing his course, decided to devote himself to teaching as a profession. In 1849 he offered himself as a mission teacher to the Presbyterian Board of Foreign Missions and was accepted for service in their work among the Creek, or Muskogee Indians, and was sent out as the principal of Tullahassee Manual Labor Boarding School. The following year (16 April 1850) he married Miss Ann Eliza Worcester, daughter of Rev. Dr. Samuel A. Worcester, superintendent of the Park Hill Mission, in the Cherokee Nation. The work of the Tullahassee Mission was interrupted by the outbreak of the Civil War, in the spring of 1861, Mr. Robertson and his family having to leave the Indian Territory as refugees. During the ensuing five years they were located at Highland, Kan., where he engaged in teaching in a mission school which was operated for the benefit of the children of the

Iowa and Kickapoo Indian tribes. Just before his return to the Indian Territory, in 1866, he was ordained to the ministry of the Presbyterian Church. The Tullahassee Mission was rehabilitated and the work of educating Creek children was resumed, his duties as a teacher occupying his time to such an extent that the work of translating was left to others. He published a paper in the Creek language called *Our Monthly* for some years. In 1876 he was in charge of the Indian educational exhibit at the Centennial Exposition for a time. A man of brilliant attainments, he lived only in his work and the impress of his life and labors remains among the people to whose betterment his self-sacrificing service was given. The property of the Tullahassee Mission was destroyed by fire, 19 Dec. 1880. The work incidental to the plans for rebuilding the mission and the disappointments and discouragements that were encountered are believed to have hastened his death.

**ROBERTSON, William Spence,** educator and historian: b. Glasgow, Scotland, 7 Oct. 1872. He came to America with his parents in 1878. He graduated B.Litt. in 1899 and M.Litt. in 1900 at the University of Wisconsin. He received his Ph.D. at Yale University in 1903. From 1903–06 he was instructor and from 1906–09 assistant professor of history at the College for Women of the Western Reserve University. In 1907 he was awarded the Herbert Baxter Adams prize in European history by the American Historical Association. After special sessions at Indiana University, from September 1909 he was assistant professor of history in the University of Illinois. Part of the years 1916–17 he spent in travel and study in South America. He is author of magazine articles on the Monroe Doctrine, the diplomatic relations between the United States and Latin America; is a member of learned societies and was decorated with the Order of the Liberator of Venezuela. His published works include ‘Francisco de Miranda and the Revolutionizing of Spanish-America’ (1909); ‘The Rise of the Spanish American Republics, as Told in the Lives of their Liberators’ (1918).

**ROBESPIERRE,** rō-bĕs-pē-ār or rō'bĕs-pēr, **Maximilien François Marie Isidore,** French revolutionist: b. Arras, 6 May 1758; d. Paris, 28 July 1794. He was the son of an avocat and having been left an orphan at 11 was sent by his grandfather to the college of his native town, from which he passed in 1770 to the Collège Louis-le-Grand at Paris on a scholarship given him by the bishop of Artois. After pursuing the study of law with great distinction, he returned, in 1781, to Arras, where he adopted the profession of advocate. Solid, rather than brilliant, he quickly became known as a skilful lawyer and a man of unimpeachable integrity. With growing success he gave much of his time to the dilettante pursuit of literature, wrote essays in competition for prizes offered by the provincial academies and was a prominent member of the Rosati, a society devoted to the cultivation of wit and letters. He was an ardent student of Rousseau and a fanatical believer in the teachings of the Genevan philosopher; indeed Robespierre's unwavering convictions in the possibility of realizing Rousseau's ideal society explains his course in the days when he stood forth as the greatest figure in France and gives the secret of his temporary success. In the events leading up to the election of the States-General Robespierre appeared prominently as the champion of the liberal views then so widespread among the French bourgeoisie. He was elected fifth deputy to the States-General from Artois and allied himself with the radical faction in that body. In the constituent assembly he spoke frequently and always in the spirit of that equality which he believed was now at length to be established in France. Of small stature and by no means robust health, weak-voiced and pale-eyed, he did not impress himself on the mass of the assembly, but those who came into personal contact with him were gained over by his tremendous sincerity and Mirabeau said of him: «That young man believes what he says; he will go far.» Robespierre's great strength, however, was in the club of the Jacobins, where his polished, classical declamations gained him the ardent support of those members who had been recruited from among the working classes and the small bourgeoisie of Paris. His power in the club became absolute when the more conservative members seceded in 1791, after the more radical faction, under the inspiration of Robespierre, had prepared the petition for the deposition of Louis XVI which led to the massacres in the Champ de Mars in 17 July. His popularity was demonstrated on the day of the dissolution of the National Assembly, 30 Sept. 1791, when Robespierre and Pétion were drawn in triumph through the streets of Paris and crowned as «incorruptible patriots» by the people. In accordance with his own motion, adopted in May 1791, prohibiting members of the constitutent assembly from sitting in the succeeding legislature, Robespierre took no direct part in the sessions of that body, but he continued to wield great influence over its deliberations through his power in the Jacobine. In February 1792 he became public prosecutor at Paris, but resigned the office in April on account of the virulent attacks of the Girondists, who regarded him with special hatred because of his opposition to their favorite policy of war against Austria. Robespierre's opposition to the war was based on humanitarian grounds; he was, besides, a man of theories and not of action and this would explain the little share he took in the uprisings of 20 June and 10 August, which, under the guidance of Danton, effected what Robespierre was quite pleased to see consummated, the overthrow of the Bourbon monarchy. Shortly after the storming of the Tuileries, Robespierre became a member of the Paris Commune; his personal popularity lent strength to that body, but his inability to prevent the prison massacres of September showed that his power was by no means absolute in the ranks of the radical party.

In the Convention to which he was elected as the first deputy from Paris, Robespierre became the leader of the Mountain. The Girondists turned the full force of their eloquence against him and accused him of aiming at the dictatorship. In the crisis which attended the trial of Louis XVI, Robespierre for once assumed a firm and definite line of action. He pleaded for the death of the king and by so doing gained over to his side the party of Danton, Carnot and Bellaud-Varenne, who were disgusted by the temporizing policy of the Girondists at a time when France was in imminent danger of foreign invasion and needed a strong government to make headway against her enemies. The condemnation of Louis XVI was a triumph for Robespierre, who, however, did not cease from his attacks on the Girondists. The struggle became one of life and death. In April, Robespierre denounced them in the body of the Convention and on the fateful days of 31 May and 2 June the destruction of the party was accomplished with the aid of the Parisian mob. See GIRONDISTS.

In July 1793, Robespierre was made a member of the Committee of Public Safety, which for a year was to be the virtual ruler of France. To curb dissension at home, so as to present a united front to the foreign foes of the country, the committee organized the Terror with which the name of Robespierre has become, through legend, synonymous. To the world at large Robespierre appeared as the master of the committee and the ruler of France. As a matter of fact, his power was in no way absolute. Of the 12 members of the committee, the majority were quite opposed to his Rousseauan ideals and only two of the 12, Couthon and Saint Just, were professed followers of Robespierre. The rest of the committee were practical men of affairs, like Carnot, Bellaud-Varenne, or Collot d'Herbois, upon whose shoulders fell the real task of government. Robespierre's services to the committee were such as his immense popularity and spotless reputation could render it. He was the apologist for the committee in the Convention and before the people, but he differed from his associates entirely so far as the motives of his action are concerned. While the Terror to them was but a thorough, though possibly radical, means for establishing peace within the country, Robespierre saw in the Terror an effective instrument for bringing about the erection of Rousseau's ideal state, by wiping out all opposed to his favorite theories. He first turned against Hébert (q.v.) and his followers in the Paris Commune, who had aroused his enmity by their uncompromising democracy, in their display of which they were guilty of the most ridiculous excesses and their professed atheism, which attained its climax in the establishment of the worship of Reason by Chaumette. The Hébertists were brought to the scaffold on 24 March 1794, and they were followed by Danton, Camille Desmoulins and their followers on 5 April. On 13 April came the turn of Chaumette. Danton fell because he had begun to advocate a moderation of the Terror and thereby had incurred the enmity both of the men of action on the Committee of Safety and of Robespierre, to whom alike the continuance of the Terror seemed essential. To hasten the work Robespierre caused the infamous law of the 22 Prairial (10 June) to be proposed by Couthon, whereby the revolutionary tribunal was freed from all restrictions of legal procedure and thus improved sent nearly 1,300 persons to the scaffold between 12 June and 28 July.

On 8 June Robespierre attained the zenith of his career, when, as president of the Convention, he celebrated with great pomp the Feast of the Supreme Being, whose existence had been formally admitted by the Convention in the preceding month. His fall followed speedily. The men on the Committee of Safety who had suffered his official leadership as long as he was content to remain largely a figurehead, turned upon him when he began seriously to assert mastery over the committee. Besides, it became apparent that the excesses of the Terror could not go on and that reparation would be demanded and Robespierre was chosen as the scapegoat of the committee. The attack on Robespierre began 17 June, when Vadier, a member of the committee of general security, satirized him before the Convention. Instead of joining battle, as he was urged to do, Robespierre went into retirement for more than a month to prepare his defense. On 26 July he appeared in the Convention and declared that the Terror should cease and that the committees of public safety and general security should be reorganized. Ominous threats appeared in his oration, which for a time held the Convention terror-stricken and caused it to vote his proposition. Quickly, however, he was assailed by various orators, the Convention reconsidered its action and in the session of the following day, the 27 July, the fateful 9th Thermidor, the secret intrigues of his associates on the committee, the fear of his intended victims and the resentment of the Dantonists, who had not forgotten the death of their leader, fell upon Robespierre. His arrest was ordered and with him that of Saint Just, Couthon, Lebas and his younger brother, Augustin Robespierre. Rescued by the national guards under Henriot and brought to the Hôtel de Ville, the great Terrorist showed no capacity for action. The Convention placed him outside of the law and despatched a portion of the national guard under Barras against him. In the assault Robespierre was shot in the jaw by a gendarme and taken in a pitiful condition to prison. On the following day he was brought before the revolutionary tribunal and with Couthon and Saint Just and others of his followers was sent to the guillotine. Consult Aulard, A., 'La Société des Jacobins' (1891); Hamel, L. E., 'Vie de Robespierre' (Paris 1865–67), the principal authority; Belloc, Hilaire, 'Robespierre' (1902); Morse-Stephens, 'Principal Speeches of the Orators and Statesmen of the French Revolution' (Oxford 1892); Brunnemann, Karl., 'Maximilien Robespierre' (Leipzig 1885); Carlyle, 'French Revolution'; Morley, John, 'Critical Miscellany' (Vol. I. London 1898); Lescure, M. de, 'La société française pendant la Terreur' (Paris 1882); Lewes, G. H., 'Life of Maximilian Robespierre, with Extracts from his Unpublished Correspondence' (3d ed., London 1899); Sardou, Victorien, 'La maison de Robespierre: réponse à M. Hamel' (Paris 1895); Strada, José de, Robespierre et la révolution de l'humanité' (Paris 1899); Warwick, G. F., 'Robespierre and the French Revolution' (London 1909).

**ROBERVAL**, rō'bėr-väl, **Giles Personne**, or **Personier, de**, French mathematician: b. Roberval, near Beauvais, 8 Aug. 1602; d. Paris, 27 Oct. 1675. His family name was Personne, the name of his birthplace being added to it. He studied at Paris in 1627–31, and was then appointed professor of philosophy at Gervais College. In 1633 he was called to the chair of mathematics at the Royal College of France, which he occupied until his death. He was the first to discover the method of indivisibles but kept it for his personal use, while Cavalieri published a similar method of his own invention, thus raising a question as to priority of discovery in which much animosity developed. He discovered the famous «Robervallian Lines»; a method of determining tangents somewhat similar to that of Descartes, again raising a question as to priority of discovery, and a method of determining the area of a cycloid. Outside the field of pure mathematics he devoted considerable study to the system of the universe, and he invented the Robervallian balance. He was one of the original members of the French Academy of Science. During his lifetime he published nothing, but his works were published after his death by Abbé Galois in the ‹Recueil› of the ‹Mémoires de l'Académie des Sciences› (1693).

**ROBERVAL, Jean François de la Roque,** SIEUR DE, French Canadian colonizer: b. Picardy, France, about 1500; d. probably at sea, 1547. He was an officer in the French army and upon the return of Jacques Cartier from Canada in 1536 he was commissioned by the king to attempt the exploration and colonization of New France in Canada. He sailed in 1542 a year after the departure of Cartier's second expedition, wintered at Stadacona (now Quebec), losing many of his men, and afterward led an unsuccessful expedition into the interior. Hunger and cold and failure of promised supplies seriously depleted the number of his followers, and, while accounts of his exploits are conflicting, Francis I appears to have summoned Roberval home to aid in the war in Picardy instead of sending relief for his expedition. He is stated by some authorities to have been killed in France, while others relate that he perished at sea on a second voyage to Canada.

**ROBIDOUX,** rō-bē'doo, **Joseph Emory,** Canadian jurist: b. Saint Philippe-de-Laprairié, Quebec, 18 March 1844. He was graduated at McGill University in 1866, was called to the bar in that year and engaged in practice at Montreal. He was later appointed queen's consul and in 1877 he became professor of civil law at McGill University. He served in the Quebec legislature in 1884–92 and in 1897–1900; was provincial secretary and later attorney-general in the Mercier administration; provincial secretary in the Marchand administration, and since 8 Oct. 1900 has been puisne judge of the Supreme Court of Quebec. He became a member of the French Legion of Honor in 1908.

**ROBIN,** a name originally applied in England to the red-breast (q.v.), a bird so familiar and so dear to the English heart that loyal colonists in many parts of the world have felt impelled to transfer the name to native species, which often resemble the original in little but the ruddy breast. The American robin is a true thrush (*Merula Magratori*) of the family *Turdicæ,* and is found in summer throughout North America from Alaska to Virginia. Robins retire from higher latitudes only as their food begins to fail, or when driven south by very heavy snows. During the winter months they are numerous in the Southern States, but even as far north as Boston robins are sometimes seen assembling round the open springs wherever berries may be found in the depth of winter. In the New England and the Middle States the robin is perhaps the most abundant breeding bird. Their nests of mud and grass are often seen on the horizontal branch of an apple tree, or in a shade tree, especially evergreens. The eggs, about four, are of a pale bluish-green, and without spots. They raise several broods in a season.

Robins feed upon insects, ripe cherries and other small fruit, but are especially fond of earthworms, which they extract from their burrows in the early morning and late afternoon with the greatest skill and industry, and of which they devour vast quantities. In spite of the fact that fruit growers consider them harmful, the cheery whistle and vivacious manners of the robin are rapidly gaining for it a place in popular esteem analogous to its English namesake. Unfortunately there are still parts of the country, and particularly of the South, where a sordid interest leads to the slaughter of great numbers of robins for the pot. In North Carolina they are killed at night in their roosting places. On the Pacific Coast the robin varies to the sub-species *propinqua,* and in lower California a distinct species (*M. confinus*) occurs. *Hesperocichla nævia* is sometimes called the Oregon robin.

**ROBIN ADAIR,** ạ-dãr, or **EILEEN AROON,** a familiar air, which, with the original words, was written, tradition says, by one Carroll O'Daly, an Irishman, of Elizabeth's time. However that may be, it was first popularized in England in the latter 18th century by Tenducci, an original singer in Dr. Arne's ‹Artaxerxes.› Tenducci probably learned it in Ireland; at least it is known that he sang ‹Eileen Aroon› with Irish words which had been phonetically arranged for him. The ‹Robin Adair› form obtained currency through its rendering by Brahm at his benefit in London in 1811. Brahm's version was introduced by Boildieu into the latter's opera of ‹La Dame Blanche.› Beethoven made a trio arrangement of it, with accompaniment by pianoforte, violin and 'cello.

**ROBIN GOODFELLOW.** See PUCK.

**ROBIN HOOD.** See HOOD, ROBIN.

**ROBIN HOOD BALLADS, The.** Ballads and tales of the outlaw have been steady favorites of the people of England. Soon after the Conquest, rebels of high rank, like Hereward and Fulke Fitz-Warine, and many a humbler hero who «concealed his life,» were said and sung by the popular muse. Their ballads, however, are lost; and the single outlaw who survives as hero of an actual ballad-cycle, and of an epic made directly from the ballad stuff, is ‹Robin Hood.› There is obvious temptation to put Robin into the Fulke Fitz-Warine class, and to regard him as a disguised nobleman like the hero of that charming but sophisticated poem, ‹The Nut-Brown Maid.› A passage in ‹Piers Plowman› (14th century) which certainly attests Robin's early and wide vogue, where Sloth, the alehouse idler, is said to know «rymes of Robin Hood and Randolf of Chester» better than his prayers, serves as an argument for the rank of the first-named outlaw. He has been made earl of Huntington. Yet another theory of origins interprets «Hood» as «Woden» and regards Robin as a divinity in disguise. Neither of these suppositions is probable. It is true that legend often borrows from myth; but the supposed mythical attributes are very far fetched in the outlaw's case, and seem impertinent. «Robin» is probably the word for «bandit,» and «Hood» may mean «of the wood.»

Professor Child concludes a very careful investigation of all the evidence and all the theories by declaring that Robin Hood is neither a nobleman of record nor yet a god; he is simply the ideal and typical outlaw, and is «absolutely a creation of the ballad muse.» Of course, some actual «banished man» who went to the greenwood as a victim and became a victor over the cruel forest-laws, may have been the nucleus of this tradition. But the story is localized in more than one place, and the hero is typical, not historical, in person, habit and surroundings. He has aristocratic traits; the «milk-white side» is no yeoman's, and his lavish but capricious generosity is part of the peasant's notion of a lord. His conventional foes are the sheriff and the monk, objects of popular satire. Like the Klepht, or bandit, hero of modern Greek ballads, Robin is the humble man's friend; he takes from the rich to give to the poor, is pious, handsome, miraculously strong and brave. This is the hero of the best and oldest ballads; like other favorites, Charlemagne, for instance, in early French epic and in stories of the 12th century, ‹Robin Hood› has two distinct phases and is at last the victim of his own typical excellence. In the best ballads he fights and kills the doughtiest of foes, like Guy of Gisborne, or else displays prodigious valor against overwhelming odds; but in the inferior verse of broadsides and garlands, Robin fares ill at the hands of wayside bullies,— tinkers, potters, what not,— who are thus glorified by victory over the champion and typical hero. Like these inferior ballads, as significant of a second literary growth, must also be reckoned the Robin Hood plays. They introduce with Maid Marian — however ancient their own proper rites — a sentimental note which is alien to the greenwood tradition. Such subjection to base uses, and such changes of character, were the penalty paid by Robin's venerable and universal fame. Pleasanter proof of this popularity is found in proverbial phrases like «going round Robin Hood's barn» and in the many place-names which he has fathered.

The Robin Hood ballads have a double appeal,— to the student of poetry for their significance, and to the lover of poetry for their worth. Thirty-six ballads are preserved, which deal with individual adventures of the hero; a few of these are trash; some are spirited and readable, though low in the poetic scale; and perhaps half-a-dozen belong with the best narrative verse. With these last must be counted the *Gest* (*gesta*, deeds), a little epic of 458 stanzas, or about 2,000 lines, which was made from ballads of the type of ‹Robin Hood and the Monk,› and was printed about 1500, although the date of composition must be put earlier. Comparison of one of the older ballads, like ‹Robin Hood's Death,› with the same story in the ‹Gest› is very suggestive for the epic problem.

At their best, these ballads are a model of popular chronicle verse. They differ widely from the romantic ballads, lacking for the most part, repetition, refrain, and all choral suggestions. They were sung, or chanted, for the story alone. Nowhere, however, is a story better told than the adventures of the Knight, Robin and the abbey folk in the ‹Gest,› and the complication of Robin and Little John and the Sheriff; while the opening stanzas of ‹The Monk› are famous for their descriptive beauty. The literature of the subject is given by Child, ‹Ballads,› III Introduction to the *Gest*. Some books and articles of later date are noted in the bibliography of the chapter on the Popular Ballad in the second volume of the ‹Cambridge History of English Literature.›

FRANCIS B. GUMMERE.

**ROBIN SNIPE,** the red-breasted sandpiper or knot (*Tringa canutus*) in its summer plumage. This is among the largest of the sandpipers, and is distinguishable by the long, perfectly straight beak combined with the absence of webbing from between the toes, the middle one of which is much shorter than the tarsus. It is upward of 10 inches long and stoutly built, with rather short stout legs. In breeding plumage the entire under parts are reddish brown, and the autumn young, which are abundant during the gunning season, have the breast and belly whitish tinged with red, and the back very characteristically marked with white and black semi-circles. Such seasonal changes in coloration are unusual among the *Scolopacidæ*. The knot is nearly cosmopolitan, breeding in high northern latitudes and wintering in the southern hemisphere. It passes through the United States in April and May, and again more leisurely in August to October, frequenting the seashore in small flocks, and, less commonly, the large rivers and lakes of the interior. Its habits are similar to those of the other sandpipers (q.v.), with which it associates. Because of its large size it is a favorite with gunners, among whom it is known in the autumn plumages as the gray-back.

**ROBINS,** rŏb'ĭnzz, **Benjamin,** English mathematician: b. Bath, 1707; d. Fort Saint David, Coromandel coast, India, 29 July 1751. He early became known as a mathematician of unusual ability, and in 1728 published a confutation of the veteran Johann Bernouilli (q.v.), who had attempted a defense of the Leibnitz theory as to the laws of motion relative to bodies impinging on one another. After some time spent as a private instructor in mathematics and physical science, he turned engineer, and made particular study of fortifications and gunnery. He published in 1742 his ‹New Principles of Gunnery,› which he had undertaken by way of furthering his unsuccessful candidacy for the professorship of fortification at Woolwich. It was translated into German and French, and has been regarded as the starting point of the modern scientific study of the matter. Much of it was derived from personal experiment with gunpowder. In 1749 he was made engineer-general to repair the forts of the East India Company. He wrote several political pamphlets, which brought him into some notice. In 1761 ‹Mathematical Tracts,› containing the ‹Principles of Gunnery,› appeared under the editorship of James Wilson.

There were subsequent editions. Consult the memoir by Wilson in this collection.

**ROBINS, Edward,** American author: b. Pau, France, 2 March 1862. He was educated at a military academy in Philadelphia, and in 1883 engaged in newspaper work. He was on the editorial staff of the Philadelphia *Public Ledger* in 1884–88, 1895–97, and has since devoted himself to authorship and as Secretary of the Corporation of the University of Pennsylvania. He has published, besides several juvenile works, 'Echoes of the Play House' (1895); 'Twelve Great Actors' (1900); 'Romances of Early America' (1902); biographies of Benjamin Franklin and Gen. William T. Sherman, etc. He is one of the Councilors of the Historical Society of Pennsylvania and a Director of the Drama League of Philadelphia.

**ROBINS, Elizabeth.** See PARKES, ELIZABETH ROBINS.

**ROBINS, Margaret Dreier,** American social economist: b. Brooklyn, N. Y., 19th century. She was privately educated and was married to Raymond Robins (q.v.), 21 June 1905. She was a founder of the Women's Municipal League, New York; was president of the New York Women's Trade Union League in 1905, of the Chicago Women's Trade Union League in 1907–14, and has been president of the national organization since 1907. She has served on the executive board of the Chicago Federation of Labor since 1908, and in 1915 was appointed to the unemployment commission by the governor of Illinois.

**ROBINS, Raymond,** American social economist: b. Staten Island, N. Y., 17 Sept. 1873. He was graduated at Columbian (now George Washington) University in 1896, and was engaged in settlement work in Chicago in 1902–05. He was a member of the Chicago board of education in 1906–09, and was social service expert for the Men and Religion Forward Movement in 1911–12, making a world tour in its interests in 1913. He was the Progressive candidate for United States senator from Illinois in 1914, and was leader of the National Christian Social Evangelistic campaign in 1915. He commanded the American Red Cross mission to Russia in 1917–18 and on his return made a report of conditions there.

**ROBINS, Thomas,** American inventor and manufacturer: b. West Point, N. Y., 1 Sept. 1868. He was educated at Princeton University and in 1892 began a series of inventions which led to the perfection of his «belt conveyor» used for carrying coal, ores and other products. The invention received the grand prize at the Paris Exposition in 1900, and first prizes at the Buffalo and Saint Louis Expositions. He is president of the Robins Conveying Belt Company and of the Robins New Conveyor Company. In 1915 he was appointed to the United States Naval Advisory Board.

**ROBINSON,** rŏb'ĭn-sŏn, **Agnes Mary Frances.** See DARMESTETER, AGNES MARY FRANCES ROBINSON.

**ROBINSON, Albert Gardner,** American newspaper correspondent and author: b. Winchester, Mass., 21 Feb. 1855. He received a public school education at Winchester and was engaged in commercial pursuits from 1871 to 1898. In the latter year he became special war correspondent for the New York *Evening Post* in Cuba and Porto Rico. He was in the Philippines on a similar errand in 1899–1900 and also in South Africa. From 1903 to 1912 Mr. Robinson was a member of the editorial staff of the New York *Sun*. He has written numerous pamphlets, magazine and newspaper articles. His published works include 'The Porto Rico of To-day' (1899); 'The Philippines: The War and the People' (1901); 'Cuba and the Intervention' (1905); 'Cuba: Old and New' (1915).

**ROBINSON, Benjamin Lincoln,** American botanist: b. Bloomington, Ill., 8 Nov. 1864. He was graduated at Harvard University in 1887 and took his Ph.D. at Strassburg in 1889. He has been curator at Gray's Herbarium since 1902, and Asa Gray, professor of systematic botany at Harvard since 1899. He has been editor of *Rhodora*, the journal of the New England Botany Club, since 1899, and also has edited 'Synoptical Flora of North America' (1892–97); 'Gray's New Manual of Botany' (7th ed.).

**ROBINSON, Beverley,** American Loyalist soldier: b. Virginia, 1723; d Thornbury, England, 1792. He was a major under Wolfe at the taking of Quebec in 1759, and at the commencement of the Revolution was a large landed proprietor on the Hudson. He was opposed to the measures of the British ministry respecting the colonies, and abandoned the use of imported merchandise. Nevertheless, he remained loyal, and reluctantly entered the military service of the Crown. The Loyal American regiment was recruited largely by him, and he was made its colonel. He was connected with the negotiations preliminary to Benedict Arnold's treason; and at the time Arnold was occupying as headquarters Robinson's country-seat. At the conclusion of the war he went to New Brunswick, where his name appears as a member of the first council, though he never took his seat; and thence to England. He lost his property by confiscation, and by way of compensation received £17,000 from the English government. Consult Ryerson, 'The Loyalists of America and Their Times' (1880).

**ROBINSON, Charles,** first governor of Kansas: b. Hardwick, Mass., 18 July 1818; d. Lawrence, Kan., 17 Aug. 1894. He was educated at Amherst and at the Berkshire Medical School, taking his M.D. in 1843. He was engaged in the practice of medicine at Belchertown, Springfield and Pittsfield, Mass., until 1849, when he went overland to California. He established the *Settlers' and Miners' Tribune* at Sacramento in 1850, was a supporter of squatter sovereignty, and worked earnestly against the movement to establish slavery in California. He was wounded in the riots of 1850, and was indicted for conspiracy and murder; but upon his election to the legislature the case was dismissed without trial. He returned to Massachusetts in 1852 and for two years edited the Fitchburg *Weekly News*. In 1854 he was appointed agent for the New England Emigrants' Aid Association and was sent to Kansas where he became the leader of the Free State party and chairman of its executive committee as well as commander-in-chief of the Kansas volunteers. He was a member of the Topeka convention which framed and adopted a Free

State constitution in 1855 and was elected governor under it in 1856. Ignoring the bogus pro-slavery legislature, but endeavoring to avoid conflict with the Federal authorities he was, upon attempting to perform his duties as governor, indicted for treason and conspiracy on a charge by the Pro-Slavery party. He was acquitted by the Federal grand jury and served out his term. He was re-elected governor by the Free State party in 1858, and was elected for a third time in 1859 under the Wyandotte constitution, taking office after the admission of Kansas to the Union as a State and serving in 1861–63. He organized most of the Kansas regiments for the Civil War during his term. He later served in both bodies of the State legislature and from 1887 he was superintendent of Haskell Institute at Lawrence. The State University of Kansas was erected on land given by him and it received the greater share of his estate. He was author of ‹The Kansas Conflict› (1892). Consult Blackmar, F. W., ‹Charles Robinson› (1902; 2d ed., 1907).

**ROBINSON, Charles Mulford,** American author and city planner: b. Ramapo, N. Y., 30 April 1869; d. 30 Dec. 1917. He was graduated from the University of Rochester in 1891, and received from it the honorary degree of master of arts in 1905. He was editor of the Rochester *Post Express* from 1891 to 1902, became an officer or honorary member of many civic societies, local, State, national and foreign, and a contributor to magazines. After 1902 he was retained to make city planning studies in municipalities in all parts of the country. He is the author of ‹The Improvement of Towns and Cities› (1901; 12th ed., 1916); ‹Modern Civic Art› (4th ed., 1917); ‹The Call of the City› (1908); ‹The Width and Arrangement of Streets› (1911); ‹City Planning› (1916). Since 1913 he has been professor of civic design (the first in the United States), at the University of Illinois. From 1907 to 1912 he was contributing editor to *The Survey*.

**ROBINSON, Charles Seymour,** American Presbyterian clergyman and hymnologist: b. Bennington, Vt., 31 March 1829; d. New York, 1 Feb. 1899. He was graduated from Williams College in 1849, studied at Union Theological Seminary and at Princeton and was ordained in the ministry in 1855. He held a pastorate in Troy 1855–60, and thereafter was pastor of various churches in New York with the exception of 1868–70, when he had charge of the American Chapel, Paris, France. He published several volumes of sermons and other works, and is widely known as a collector of hymns. His publications include ‹Songs of the Church› (1862); ‹Church Work› (1873); ‹The Pharaohs of the Bondage and the Exodus› (1887); ‹New Laudes Domini› (1892); ‹Annotations on Popular Hymns› (1893); ‹Simon Peter: Later Life and Labors› (1894), etc.

**ROBINSON, Christopher,** Canadian lawyer: b. Toronto, 21 Jan. 1828; d. 1903. He was a son of Sir John Beverley Robinson (q.v.), and was educated at Upper Canada College, King's College and Trinity University, Toronto. He was called to the bar in 1850 and engaged in practice at Toronto in 1852. He was reporter to the Queen's Bench in 1856–72; became editor of *Law Reports* in 1872, and resigned in 1885 upon becoming a bencher of the Law Society of Canada. He consistently declined public office, and became the acknowledged leader of the Canadian bar. He served as counsel in numerous important cases, among them being the trial of Louis Riel for high treason in 1885; the libel suit of the queen against Wilkinson; the case for the arbitration of the Manitoba boundaries, and the Bering Sea arbitration with the United States.

**ROBINSON, Clifford William,** Canadian statesman: b. Moncton, New Brunswick, 1 Sept. 1866. He was educated at the University of Mount Allison College, Sackville, New Brunswick, and became attorney-at-law in 1892, engaging in practice at Moncton He was elected to the provincial Parliament in 1897, became speaker in 1903, provincial secretary in 1907 and Premier later in that year. In 1908 he became leader of the Liberal opposition. He was a member of the government without portfolio after his return to the New Brunswick Parliament in 1917.

**ROBINSON, Sir Clifton,** English engineer: b. Birkenhead, 1 Jan. 1848; d. 6 Nov. 1910. He joined the staff of George Francis Trainer and in 1860 assisted in the construction at Birkenhead of the first tramway in Europe. He was later engaged in similar work in America and Continental Europe as well as in England, building the pioneer system of cable and electric railways at Los Angeles, Cal. He was a pioneer of electric traction in London, designed and constructed the London United Electric Tramway system, and built the first electric tramway at Bristol in 1895. He was manager, director and engineer of the Imperial Tramway Company, and in 1902 was connected with the promotion of the great tube railway system in London. In 1906 he devised and successfully put into operation a system of through booking between the electric tramways and the underground railway systems of London. He was knighted in 1905. He was author of many articles and treatises on tramway construction.

**ROBINSON, Doane** (JONAH LEROY ROBINSON), American editor and historian: b. Sparta, Wis., 19 Oct. 1856. He was educated at the University of Wisconsin and was admitted to the bar in 1882. In 1884 he was editor of the *Courier* at Watertown, S. D., in the following year was secretary to the Territorial Railroad Commission of Dakota, and of the first Railroad Commission of South Dakota in 1890–91. Mr. Robinson edited *The Interstate* of Gary, S. D., in 1894 and the *Daily and Weekly Gazette* of Yankton, S. D., in 1896 and in 1898 organized the *South Dakotan Monthly* at Sioux Falls. He subsequently became State librarian, secretary and superintendent of the State Historical Society at Pierre, S. D. He published ‹Coteaus of Dakota› (1899); ‹History of South Dakota› (1900); ‹History of Leavenworth's Expedition and Conquest of Ree Indians› (1902); ‹History of Dakota› (2 vols., 1903); ‹History of Sioux Indians› (1904); ‹Brief History of South Dakota› (1906) and contributions to encyclopedias and periodicals.

**ROBINSON, Edward,** American Biblical scholar: b. Southington, Conn., 10 April 1794; d. New York, 27 Jan. 1863. He was graduated at Hamilton College in 1816 and went in 1821 to Andover to publish his edition of books i–ix, xviii and xix of the ‹Iliad›. There he aided Moses Stuart (q.v.) in the preparation of the second edition (1823) of the latter's ‹Hebrew Grammar,› and rendered into English (1825) Wahl's Clavis Philologica Novi Testamenti.› After European study, largely in Halle and Berlin (1826–30), he was professor extraordinary of sacred literature in the Andover Theological Seminary in 1830–33, and professor of Biblical literature in Union Theological Seminary from 1837 until his death. In 1838 and 1852 he visited Palestine with the scholarly missionary, Eli Smith, and there made careful surveys and investigations. His chief work, ‹Biblical Researches› (1841; 3 vols. compressed into 2, with a 3d 1856), which obtained for him the Royal Geographical Society's gold medal, was based on these studies. He was a leading member of the American ethnological, geographical and Oriental societies, and edited in 1831–34 the ‹Biblical Repository,› in 1843 the ‹Bibliotheca Sacra,› with which the ‹Repository› was incorporated, and for which he continued to write until 1855. Among his other publications are ‹A Dictionary of the Bible› (1883); editions of Buttmann's ‹Greek Grammar› (1833; 3d ed., 1851) and Gensenius' ‹Hebrew Lexicon› (1836; 5th ed. 1854), and Greek (1845; 2d ed., 1851) and English (1846) ‹Harmonies of the Gospels.› Consult Hitchcock, ‹Life, Writings and Character of Edward Robinson› (1863).

**ROBINSON, Edward,** American archæologist: b. Boston, Mass., 1 Nov. 1858. He was graduated at Harvard University in 1879, later spending five years in study in Europe, including 15 months in Greece and three semesters at Berlin. He was curator of classical antiquities at the Boston Museum of Fine Arts in 1885–1902 and director in 1902–05. He became assistant director at the Metropolitan Museum of Art, New York, in 1906, and in 1910 succeeded Sir Caspar Purdon Clarke as director. He lectured on archæology at Harvard in 1893–94 and in 1898–1902, and was secretary of the art commission of Boston in 1890–98. He has contributed many articles to periodicals as well as to the *Bulletin* of the Metropolitan Museum of Art.

**ROBINSON, Edward Van Dyke,** American economist: b. Bloomington, Ill., 20 Dec. 1867; d. 10 Dec. 1915. He was graduated at the University of Michigan in 1891 and took his Ph.D. at Leipzig in 1895. He was engaged in teaching and lecturing on commercial geography, physiography, economics and political science in 1895–1907; was appointed professor of economics at the University of Minnesota in 1907, and in 1915 accepted that chair at Columbia University. He was a contributor to scientific periodicals and was author of ‹Nature of the Federal State› (1893); ‹War and Economics› (1900); ‹Text Book on Commercial Geography› (1909); ‹Cost of Government, National, State and Local› (1912); ‹Economic Conditions and the Development of Agriculture in Minnesota› (1915), etc.

**ROBINSON, Edwin Arlington,** American poet: b. Head Tide, Me., 22 Dec. 1869. He was educated at Gardiner, Me., and at Harvard University in 1891–93. His poetic work has been very well received by discriminating critics who have pronounced it thoroughly American in tone and free of the meaningless twaddle all too common among our poets. His works are ‹The Torrent and the Night Before› (1896); ‹The Children of the Night› (1897); ‹Captain Craig› (1902); ‹The Town Down the River› (1910); ‹Van Zorn,› a play (1914); ‹The Porcupine,› a play (1915); ‹The Man Against the Sky,› poems (1916); ‹Merlin,› a poem (1917). See MERLIN; VAN ZORN.

**ROBINSON, Ezekiel Gilman,** American Baptist clergyman and educator: b. Attleborough, Mass., 23 March 1815; d. Boston, Mass., 13 June 1894. He was graduated at Brown University in 1838 and at Newton Theological Seminary in 1842. He held pastorates at Norfolk, Va., and Cambridge, Mass., in 1842–46; was professor of Biblical interpretation at the Western Theological Seminary, Covington, Ky., in 1846–50, and pastor at Cincinnati, Ohio, in 1850–53. He became professor of theology at the Rochester Theological Seminary in 1853 and president in 1860. In 1872–89 he was president of Brown University, and from 1893 until his death was professor of ethics and apologetics at the University of Chicago. He edited the *Christian Review* in 1859–64, and was author of ‹Yale Lectures on Preaching› (1883); ‹Christian Theology› (1894); ‹Autobiography› (ed. Johnson, E. H., 1896), etc.

**ROBINSON, Frederick Cayley,** English artist: b. Brentford, Middlesex, 18 Aug. 1862. He studied at the Royal Academy Schools and in Paris and Italy. His work is characterized by much care in finish and has a certain tendency toward mediæval effects. He illustrated Genesis for the Medici Society and painted the mural decorations for the Middlesex Hospital in 1910–14. Among his earlier works are ‹Outward Bound›; ‹The Ferry›; ‹Drifting›; ‹Souvenir of a Past Age› (Adelaide Permanent Collection); ‹The Foundling.› After studying in Italy he painted in a different style, his works including ‹Fata Morgana›; ‹Winter Twilight,› etc., and study in Paris influenced his later works, among which are ‹The Deep›; ‹Midnight›; ‹Dawn›; ‹Youth› (Cape Town Collection); ‹The Fisherman› (Italian National Collection); ‹Death of Abel› (Luxembourg, Paris), etc.

**ROBINSON, SIR Frederick Philipse,** English soldier: b. near New York, September 1763; d. Brighton, England, 1 Jan. 1852. He became ensign in 1777 in a Royalist American regiment, raised by his father, and fought in the battles of Horseneck, Stony Point and New London. He returned to England in 1784; entered the West India service in 1794 and was present at the capture of Martinique, Saint Lucia and Guadeloupe. He became colonel in 1812 and commanded a brigade in the Peninsula campaign of 1913, where he fought gallantly; was promoted major-general in 1814 and rewarded with a medal. He took part in the engagement before Plattsburg in 1814 during the war with the United States, and in 1816 left Canada for the West Indies, where he was put in command of the troops in the Windward and Leeward islands and for a time was governor of Tobago. In 1841 he became general. At the time of his death he was the soldier of longest service in the British army.

**ROBINSON, Frederick William,** English novelist: b. London, 23 Dec. 1830; d. there, 6 Dec. 1901. He was educated at Clarendon House, Kensington, and in 1851 began his career as a novelist, though he frequently contributed special articles to periodicals and for five years wrote dramatic criticisms for the *Daily News.* He founded and edited *Home Chimes,* which ran as a weekly two years and then became a monthly. He was a prolific writer and over 50 titles of novels stand to his credit. Some of them are as follows: ‹The House of Elmore› (1855); ‹One and Twenty› (1858); ‹No Church› (1861); ‹Female Life in Prison› (1862); ‹A Woman's Ransom› (1864); ‹Beyond the Church› (1866); ‹Stern Necessity› (1870); ‹Her Face Was Her Fortune› (1873); ‹Second Cousin Sarah› (1847); ‹The Romance of a Back Street› (1878); ‹Lazarus in London› (1885); ‹The Keeper of the Keys› (1890); ‹The Secretary› (1895); ‹Sweet Nineteen› (1896). His skilfully constructed and fluently told fictions were as popular in this country as in his own.

**ROBINSON, Geoffrey,** English journalist: b. 1874. He was educated at Oxford, was a Fellow of All Souls' College in 1898, and in 1901–05 he was private secretary to Lord Milner in South Africa. He edited the Johannesburg *Star* in 1905–10; was afterward South African correspondent for the London *Times,* and from 1912 was editor and director of the *Times.*

**ROBINSON, Henry Crabb,** English barrister and diarist: b. Bury Saint Edmunds, 3 May 1775; d. London, 5 Feb. 1867. In 1796 he entered a solicitor's office in London, and in 1800 went to Germany, where he spent five years in studying at Jena and elsewhere, and in making the acquaintance of Goethe, Schiller, Wieland, Herder, Kotzebue and other noted Germans. In 1807 he went to Altona as *Times* correspondent, and in 1808–09 was war correspondent in Spain for the same newspaper. He was called to the bar in 1813, and practised until 1828. He was associated with the foundation of the University of London in 1828. His fame as a conversationalist approached that of Rogers, but he never made any serious attempt to gain distinction as a writer. His intimate acquaintance with many of the greatest men and women of his time, both in his own country and on the Continent, such as Wordsworth, Lamb, Coleridge, Southey, Flaxman and Clarkson, gives peculiar interest and value to the selections from his ‹Diary, Reminiscences, and Correspondence,› edited by Sadler in 1869. He was one of the founders of the Athenæum Club and of University College, London. Consult Vincent, L. H., ‹Dandies and Men of Letters› (Boston 1913).

**ROBINSON, Sir Hercules George Robert, 1st Baron Rosmead,** British colonial governor: b. 19 Dec. 1824; d. London, 28 Oct. 1897. He was educated at Sandhurst and was commissioned in the 87th regiment (Irish Royal Fusiliers) in 1843. He retired from the army in 1846 and became commissioner of public works for Ireland, rendering admirable service during the Irish famine of 1848. In 1854 he was appointed president of Montserrat in the West Indies, and in 1855 he became lieutenant-governor of the neighboring island of Saint Christopher, where he introduced coolie labor from India with excellent results. In 1859 he was promoted governor of Hongkong and was in office during the war with China in 1860–61. He was governor of Ceylon in 1865–68 and reorganized its public works department so that it became a model in British colonial administration. He was governor of New South Wales in 1872–79, negotiating the cession of the Fiji Islands, and in 1879 he became governor of New Zealand. He was appointed governor of Cape Colony and high commissioner of South Africa in 1880, arriving in January 1881, and was called upon to establish the peace following the first Boer War. His administration was exceedingly able under circumstances of marked difficulty. He labored earnestly to establish a responsible colonial government and to institute cordial relations between the British and Dutch settlers, besides improving internal communication and opening new territory. He was continued in office two years beyond the usual term of a governor and received a baronetcy in 1891. In 1895, at the urgent request of Lord Rosebery's government, he returned to South Africa and resumed his former position. The Jameson raid, carried out without his knowledge, brought his negotiations with the South African Republic to an end. He secured the release of the raiders but could do little to remedy the troubles which resulted in the War of 1899, although at the time of his departure in May 1896 he had established comparative calm. He was created Baron Rosmead in 1896.

**ROBINSON, James Harvey,** American historian and educator: b. Bloomington, Ill., 29 June 1863. He was graduated at Harvard in 1887 and took his Ph.D. at Freiberg in 1890. In 1891 he was lecturer on European history at the University of Pennsylvania; and in 1892–95 he was assistant professor of history at Columbia University, where he has held the chair of history since 1895, acting also as dean of Barnard College in 1900–01. He is favorably known for his original methods and broad scope as a teacher of history. He edited the *Annals* of the American Academy of Political and Social Science in 1891–95; and since 1911 has been associate editor of the *American Historical Review.* He was joint editor of ‹Translations and Reprints from the Original Sources of European History›; and joint author of ‹Petrarch, the First Modern Scholar and Man of Letters› (1899); ‹Development of Modern Europe› (2 vols., 1907); and ‹Readings in Modern European History› (2 vols., 1908–09). Author of ‹The German Bundesrath› (1891); ‹Introduction to the History of Modern Europe› (1903); ‹Readings in European History› (2 vols., 1904–05); ‹The New History› (1911), etc.

**ROBINSON, John,** English Independent clergyman: b. Lincolnshire, about 1576; d. Leyden, Holland, 1 March 1625. It has been widely assumed that he was educated at Corpus Christi College, Cambridge. He was, say certain later writers, suspended from a benefice in Norfolk. He himself mentions a residence in Norwich, where he was religious director of a band of worshippers, and where certain persons were excommunicated for their interest in his instruction. In 1608 he emigrated to Amsterdam, with several of the congregation of the church at Scrooby Manor, Nottinghamshire, and thence in 1609 to Leyden, where he was ordained pastor, with William Brewster (q.v.) as ruling elder. In 1611 a building was purchased for 8,000 guilders for use as a meeting-house. Mather in his ‘Magnalia’ says that “those famous divines, Polyander and Festus Hommius, employed this our learned Robinson to dispute publicly in the University of Leyden against Episcopius, and the other champions of that grand choke-weed of true Christianity” (Arminian doctrine). There may be some foundation for the story of such a disputation; but it was probably not at Polyander's request, nor at the university, where Episcopius was in power. Robinson was admitted to the university in 1615 and attended Episcopius' lectures. He took a very active interest in the project for emigration to America; and had a majority of his church volunteered would have accompanied them hither. Previous to the sailing of the *Speedwell* he preached on 21 July 1620, observed as a day of prayer and humiliation. His celebrated address is given in Winslow's ‘Hypocrisie Unmasked’ (1646), the author remarking that Robinson “used these expſessions, or to the same purpose,” and some allowance must be made for such improvements and embellishments as Winslow may have made to suit his controversial purpose. Robinson corresponded with the “church of God at Plymouth, New England.” Mather calls him “a most wise, grave, good man,” and Robert Baillie, “the most learned, polished, and modest spirit” among the Separatists. A tablet marks the house in which he lived in Leyden, and Peter's Church, where he is buried, also contains a bronze memorial. His ‘Works,’ with memoir and notes of Robert Ashton, appeared in 1851. The most important of his works which were published were ‘A Justification of Separation from the Church of England’ (1610); ‘Of Religious Communion’ (1614); ‘Essays or Observations Divine and Moral’ (1625). Consult Bradford, ‘History of Plymouth Plantation’ (Coll. of the Mass. Hist. Soc., 4th ser., Vol. III, 1856); Mather, ‘Magnolia’ (1702); Neal, ‘History of New England’ (1720); Brook, ‘Lives of the Puritans’ (1813); Dexter, ‘Congregationalism of 300 Years’ (1880); ‘Life’ by Davis (1903); Burrage, Champlin, ‘New Facts Concerning John Robinson’ (Oxford 1910).

**ROBINSON, Sir John Beverley,** Canadian jurist and statesman: b. Berthier, Quebec, 26 July 1791; d. Toronto, 31 Jan. 1863. He was educated under Dr. John Strachan at Kingston and was admitted to the bar in 1814. He served as clerk of the assembly of Upper Canada in that year, and in 1815 read law at Lincoln's Inn, London. Returning to Canada he became Solicitor-General, and he was leader of the Conservatives in Upper Canada in 1818-29. He was speaker of the Legislative Council in 1828-40; and from 1829 until shortly before his death he was chief justice of Upper Canada. His reputation as a justice was high, not one of his decisions ever being reversed on an appeal. He was opposed to the union of the two Canadas, but upon its accomplishment he rendered invaluable assistance in adjusting financial arrangements, receiving the thanks of the Upper Canadian assembly. He was a Tory of pronounced opinions and was by many considered a reactionary, but admittedly possessed the highest principles and sound patriotism. He wrote several pamphlets, the most notable being his argument against the Canadian union, ‘Canada and the Canada Bill’ (1839). He was created a baronet in 1854. Consult Robinson, C. W., ‘Life’ (1904) and Dent, J. C., ‘Canadian Portrait Gallery’ (Vol. IV, 1881).

**ROBINSON, John Cleveland,** American soldier: b. Binghamton, N. Y., 10 April 1817; d. there, 18 Feb. 1897. He entered West Point in 1835, but withdrew in 1838 to study law, accepting, however, a commission as 2d lieutenant in 1839. He was engaged in the Mexican and Seminole wars, was promoted captain in 1850 and at the outbreak of the Civil War was commissioned colonel of volunteers. He was in command of Fort McHenry at the opening of the war; successfully defended it, and was later engaged in organizing volunteer troops. He commanded a brigade in the Army of the Potomac in the Seven Days' battle before Richmond; was present at the battles of Fredericksburg, Chancellorsville, Gettysburg, Wilderness and Spottsylvania, and in the last lost a leg and was prevented from further active service. He was voted a medal of honor by Congress; was brevetted major-general of volunteers in 1864 and of regulars in 1865. In 1866 he was mustered out of the volunteer service and accorded rank as colonel in the regular army. He was in command of the Department of the South in 1867, of the Lakes in 1868-69, and in the latter year was retired with rank of major-general. He was elected lieutenant-governor of New York in 1872, was commander-in-chief of the G. A. R. in 1877-78, and president of the Society of the Army of the Potomac in 1887-88.

**ROBINSON, Joseph Armitage,** English clergyman: b.—. He was educated at Cambridge, took priest's orders in the Established Church in 1882 and was vicar of All Saints, Cambridge, 1888-92. From 1893 to 1899 he was Norrisian professor of divinity at Cambridge, and was prebendary of Wells' Cathedral 1894-99. He was rector of Saint Margaret's, Westminster, 1899-1900, canon of Westminster 1899-1902, and in the year last named succeeded Dean Bradley as dean of Westminster Abbey. He has published ‘A collection of the Athos Codes of the Shepherd of Hermas’ (1888); ‘Appendix to the Apology of Aristides’ (1891); ‘The Passion of Saint Perpetua’ (1891); ‘The Philocalia of Origen’ (1893); ‘Euthaliana’ (1895); ‘Unity in Christ’ (1901); ‘The Study of the Gospels’ (1902); ‘Some Thoughts on the Incarnation’ (1903); ‘Commentary on the Epistle to the Ephesians’ (1903; 2d ed., 1904); ‘On the Athanasian Creed’ (1905); ‘The Vision of Unity’ (1908); ‘The Advent Hope in Saint Paul's Epistles’ (1911); ‘Holy Ground’ (1914).

**ROBINSON, Sir Joseph Benjamin,** South African capitalist: b. Cradock, Cape Colony, 3 Aug. 1840. He engaged in wool-buying and farming until 1867, increasing his holdings to 20,000 acres at Vaal River after the discovery of diamonds. He was the discoverer of the Langlaagte gold mine and became owner of the Radfontein gold fields. He was mayor of Kimberly in 1880, and was for four years a member of the Cape Parliament, in which time he secured the passage of the Diamond Trade Act.

He fought for the Free State in the Basuto War. He was created a baronet in 1908.

**ROBINSON, Joseph Taylor,** American senator: b. Lonoke, Ark., 26 Aug. 1872. He was educated at the University of Arkansas, was admitted to the bar in 1895 and engaged in practice at Lonoke. He was elected to the general assembly in 1895, and in 1903–13 was a member of Congress. He resigned from Congress in 1913 after his election as governor of Arkansas, but a few days after taking office he resigned that post also in order to accept an appointment to the United States Senate, succeeding Jefferson Davis for the term ending in 1919. He was re-elected for the term ending in 1925.

**ROBINSON, Robert,** English preacher and hymn writer: b. Swaffham, Norfolk, 27 Sept. 1735; d. Birmingham, 9 June 1790. Lack of funds prevented his studying for the Anglican ministry, but he came under the influence of Whitefield in 1752, and in 1758 became a preacher. A year later he joined the Baptist faith, preaching at the Stone Yard Baptist Chapel, Cambridge, for two years before he was ordained pastor. He became popular as a preacher, built a new church in 1764 and without neglecting his clerical duties supported himself by farming and a corn and coal business. He later became practically a Unitarian, and after 1783 left the Baptist Church, engaging in preaching at Chesterton and Birmingham. Of his hymns two are still in use, ‹Come Thou Fount of Every Blessing› and ‹Mighty God While Angels Bless Thee.›

**ROBINSON, Stuart,** American Presbyterian clergyman: b. Strabane, near Londonderry, Ireland, 26 Nov. 1814; d. Louisville, Ky., 5 Oct. 1881. He was graduated at Amherst College in 1836, studied theology at Union Seminary, Prince Edward, Va., and was ordained in 1841. He was pastor at Kanawha Salines, W. Va., 1841–47, in 1856–58 professor of ecclesiology in the Presbyterian Seminary at Danville, Va., and then became pastor at Louisville. He edited the *True Presbyterian,* which was suppressed by the government in 1862 for disloyalty, and he then removed to Toronto. In 1865 he published ‹Slavery as Recognized by the Mosaic Civil Law, and Allowed in the Abrahamic, Mosaic and Christian Church,› and in 1866 resumed his Louisville pastorate and reissued his paper as *The True Christian Commonwealth.* His persistence in expressing his former views led to his expulsion from the Presbyterian General Assembly, and by his influence the Kentucky synod joined the Southern General Assembly in 1869, which body made him its moderator. He was a delegate to the Pan-Presbyterian council at Edinburgh in 1877. He wrote ‹The Church of God an Essential Element of the Gospel› (1858), and published ‹Discourses of Redemption› (1866).

**ROBINSON, Theodore,** American artist: b. Irasburg, Vt., 1852; d. New York, 2 April 1896. He studied under Carolus-Duran and Gérôme in Paris and under Claude Monet at Giverney. He opened a studio in New York, devoted himself chiefly to landscape and figure painting and became a leader of the Impressionist school. He was awarded the Webb prize for his ‹Winter Landscape› (1890), and the Shaw prize for his study of a peasant girl ‹In the Sun› (1892). Among his works are ‹A Bridge›; ‹In the Sunlight›; ‹On the Tow Path›; ‹West River Valley — Vermont›; ‹Giverney› and ‹Girl with Cow› (Metropolitan Museum); ‹Correspondence,› etc.

**ROBINSON, Theresa Albertine Louise von Jakob,** German-American author: b. Halle, Prussia, 26 Jan. 1797; d. Hamburg, 13 April 1870. She was the second wife of Edward Robinson (q.v.), and was known in Germany as an author under the name of «Talvj» (formed from her initials). While residing at Kharkoff she began to study Slavonian, and wrote her first poems. In 1824 she published a few tales in a volume bearing the title ‹Psyche.› She also published, in 1825–26, translations of a number of Serbian popular songs entitled ‹Volkslieder des Serben.› In America she began the study of aboriginal languages and translated into German Pickering's work on the Indian tongues. In 1834 she wrote a ‹Historical Review of the Slavic Languages› for the ‹Biblical Repository,› republished in enlarged form in 1850. During her husband's visit to Palestine she resided in Germany, where she published, in 1840, ‹Charakteristik der Volkslieder germanischer Nationen mit einer Uebersicht der Lieder aussereuropäischer Völkerschaften.› ‹Die Colonisation von Neu-England› was published at Leipzig in 1847; a defective translation by W. Hazlitt, Jr., appeared in London in 1851. She also wrote numerous tales, and contributed to magazines, both German and English. ‹Heloise,› ‹Life's Discipline› and ‹The Exiles› were German tales translated into English by her daughter (1850–53). ‹Fifteen Years: A Picture of the Last Century› appeared in 1870, and ‹Gesammelte Novellen› in 1874.

**ROBINSON, William Erigena,** American journalist and legislator: b. Unagh, County Tyrone, Ireland, 1814; d. Brooklyn, N. Y., 23 Jan. 1892. He emigrated to the United States in 1836, took out his first naturalization papers in 1837 and in 1841 was graduated at Yale University. He later engaged in journalism; was on the staff of the New York *Tribune* in 1844–48, writing under the pseudonym «Richelieu,» a name he used for occasional writings until his death. He engaged in law practice in New York in 1854; was assessor of internal revenue for Brooklyn in 1862–67, and served in Congress in 1867–69 and in 1881–84. He secured the passage of a bill to protect the rights abroad of naturalized as well as native-born citizens, and was an advocate of penny postage and of Cuban independence. In 1847–48 he organized the movement for the relief of the famine in Ireland.

**ROBINSON, William S.,** American landscape painter: b. East Gloucester, Mass., 1861. He studied in Boston, France and Holland. He was instructor in art at Maryland Institute, Baltimore, in 1885–89; at Drexel Institute in 1891–93; at the Pennsylvania Academy of Fine Arts in 1892–99, and at Columbia University in 1894–1904. He took honors at the Paris, Buffalo, Saint Louis and Panama Expositions, and in 1900 was elected to the National Academy. Among his works are ‹The Golden Bough› (Carnegie Institute, 1908); ‹White Birches› (1913); ‹Whiteface Chasm, Monhegan› (1913); ‹September› (1915), etc.

**ROBINSON,** Ill., city, county-seat of Crawford County, on the Wabash River, and on the Cleveland, Cincinnati, Chicago and Saint Louis and the Illinois Central railroads, 45 miles southwest of Terre Haute, Ind. It was settled in 1842, when it became the county-seat; was incorporated as a village in 1866 and as a city in 1886. It is the trade centre of a fruit and grain-growing and sheep-raising region, and contains a few small mills, an oil refinery and oil-well supply works, hospital and sanitarium. It has four banks. It contains a township high school founded in 1885, with a school library of over 600 volumes and a Carnegie library, an Elk's home, Federal building and courthouse. The city is governed by a mayor and a council of 12; the members of the council are elected for two years, six being chosen each year. Pop. (1920) 3,368.

**ROBINSON CRUSOE,** the best-known work of Daniel Defoe and one of the most widely read of all modern books, was published at London, on or about 25 April 1719, by William Taylor at the Sign of the Ship in Pater Noster Row, in an octavo volume somewhat exceeding 350 pages, with a frontispiece representing the hero in his goatskin clothes, and under the following show-case or display title: «The Life and Strange Surprizing Adventures of Robinson Crusoe, of York, Mariner: Who lived Eight and Twenty Years, all alone in an un-inhabited Island on the Coast of America, near the Mouth of the Great River of Oroonoque; Having been cast on Shore by Shipwreck, wherein all the Men perished but himself. With An Account how he was at last as strangely deliver'd by Pyrates. Written by Himself.» It was a rather expensive, not ill-looking book, marred, however, by a considerable number of typographical blunders.

Defoe at the time of its publication was apparently in his 60th, possibly in his 61st year. He was very widely but not favorably known as a bankrupt merchant who more than 20 years before had turned pamphleteer and politician. His satire ‹The True-Born Englishman› (1701) had brought him fame, but shortly afterward he was ruined through his exposure in the pillory and his imprisonment for writing his ironical tract ‹The Shortest Way with the Dissenters,› and he became in consequence a political journalist, a secret government agent and a miscellaneous writer whose pen was supposed to be as venal as it was prolific. Since the accession of the Hanoverians in 1715 he had been much attacked for his relations with Jacobite newspapers, the fact that he was in reality employed by the government to watch them not being generally known. Of his thousands upon thousands of pages in periodicals, pamphlets and books nearly all had been anonymous, and, while his style often betrayed him, he had been detected in writing nothing that on the surface markedly resembled ‹Robinson Crusoe.› Yet it was not long before his hand was recognized in that, a fact which led to some rather stupid criticism of the book; and in our own day certain preliminary essays of his in more or less fictitious writing have been discovered, which make his success in the new vein, which he soon began to practise assiduously, somewhat less surprising than it would have been had he suddenly changed to an unwonted field of composition and produced a masterpiece. That something novel and important had been added to English fiction was speedily shown by the unparaleled popularity of ‹Robinson Crusoe,› in its full form, in cheap abridgments, in translations and in frank imitations. We do not know the size of the editions, but we do know that before the end of 1719 there were probably six authorized impressions, a Dublin reprinting and several piratical issues, not counting serial publication in a newspaper. No previous English story had been so circulated, and by August 1719 the canny author had presented the public with a second instalment of his hero's history, likewise published by Taylor, ‹The Farther Adventures of Robinson Crusoe; Being the Second and Last Part of his Life, And of the Strange Surprizing Accounts of his Travels Round three Parts of the Globe.› This, while fairly popular and a creditable piece of travel-fiction, was not, as Defoe fondly thought, contrary to the usage of second parts «every Way as entertaining as the First,» a verdict which applies with still greater force to the so-called third part published by Taylor a year later (1720), really not fiction at all but a volume of essays entitled ‹Serious Reflections during the Life and Surprising Adventures of Robinson Crusoe: With his Vision of the Angelick World.› Both of these parts, like the first, bore the legend «Written by Himself,» for those were days when serious people denounced fiction as «lies,» and Defoe indulged in some curious exegesis in his prefaces in order to justify to his Non-Conformist's conscience his lucrative story-writing.

To follow the fortunes of ‹Robinson Crusoe› after 1719 would require a large volume. Here only a few salient facts can be given. At least three additional authorized reprintings were needed before Defoe died in 1731, quaint illustrations were introduced, several abridgments appeared, one of which, apparently made by Defoe himself and covering all three parts, went through numerous editions during the next hundred years, the three parts were translated into Dutch, French and German, and a large number of imitations made unsuccessful attempts to rival the popularity of the original, although in some cases attaining themselves considerable vogue. The story took root more strongly perhaps in Germany than in any other foreign country, but it was and remained very popular in France, and before many years had elapsed Italians also could read it in their native tongue. It has since been translated into all sorts of languages and dialects, it has fascinated wandering Arabs, it is taught to school children in our island possessions and it is accessible in Esperanto. One of the largest collections of «Crusoes,» that of Mr. William S. Lloyd of Philadelphia, contains some 400 volumes, but unrecorded issues in English and in other tongues are continually coming to light. Some of the modern editions are true works of art, very distinguished artists, especially in France, having striven to illustrate adequately so famous a book.

It has naturally attracted also both scholars and literary critics and gossips, with the usual darkening of counsel. It may fairly be said that scarcely one of the numerous stories and speculations about Defoe and his chief book will bear investigation. He cannot be shown to have made misuse of Selkirk's papers, it is highly unlikely, to say the least, that Robert Harley, Earl of Oxford, had anything to do with writing the first part, it is far from certain that Defoe had any difficulty in getting that part published, it could not possibly have been written at most of the places assigned for its composition, and was probably thrown off hastily at Defoe's house at Stoke Newington not long before it was issued, and, finally, all attempts to see in the book a serviceable allegory of Defoe's life, however much support they may receive from his sophisticated prefaces, are likely to prove valueless and not a little absurd. The truth is that scarcely anything definite is known about the origin of the great story except that it is clearly Defoe's, since it was assigned to him by fellow-journalists of the time, and since in all three parts, from first page to last, the minute student finds the stylistic evidence of his authorship overwhelming, and that doubtless the occasion for Defoe's attempting to describe the life of a shipwrecked sailor upon a far-off deserted island was the publication of accounts by Capt. Woodes Rogers, Capt. Edward Cooke, Sir Richard Steele and others of the strange adventures of the Scotch sailor Alexander Selkirk or Selcraig, during a more than four years' solitary sojourn on the island of Juan Fernandez off the coast of Chile. That this is not Crusoe's island the very title-page of the book plainly shows — many persons, inquisitive in small matters, seem to be unduly positive that Tobago should have that honor — but it is about as clear as such things can ever be that poor Selkirk's story influenced Defoe. He may have taken hints from the experiences of other castaways and from other narratives of travel, also — indirectly if at all — from Grimmelshausen's ‹Der abenteuerliche Simplicissimus and from a Dutch story, Hendrick Smeeks' ‹Beschrijvinge van het magtig Koningrijk Krinkle Kesmes›; but in the main most of the «sources» for the masterpiece discovered by indefatigable scholars are imaginary or at best barely possible, and ‹Robinson Crusoe,› like ‹Paradise Lost› and many of Shakespeare's plays, may truly be said to derive its greatness from the appeal of its subject matter and from its author's own genius. It is doing Defoe no injustice to say that, on the whole, it is the exceptional interest attaching to the central part, the island portion, of the first volume of ‹Robinson Crusoe› that has contributed most to giving the story its extraordinary currency. The third volume, the ‹Serious Reflections,› while not without merit, has been but seldom reprinted and is little known. The second volume, ‹The Farther Adventures,› possesses more merit and has been many times reprinted to accomplish the first, but it is seldom specially in mind when the book is mentioned. Even the extra-island portions of the first volume — the experiences in Africa and Brazil and the concluding journey through Spain — good of their kind though they are — do little to make the book impressive. What profoundly impresses us is the frightful loneliness, the struggle of the ordinary sailor-hero against what seem to be overwhelming odds, his final success, although his endowments, except perhaps in physical resistance, are no higher than we may well suppose our own to be. Our sympathy and our curiosity — two mighty elements in the success of a book if the author can but arouse them thoroughly — are brought into play from the shipwreck to the departure, although some may experience a slight flagging of interest after the life with Friday has been described. «Would I have thought of doing that?» is the question, however egotistical, that continually presents itself, and in reflecting upon it we can legitimately bring Defoe in for a high share in the praise we bestow on his book. ‹Robinson Crusoe› through the universality of its appeal has much of the carrying power of the world's greatest poems, but Defoe, although possessed of more imagination than is often given credit for, was not a great poet. He was, however, as a journalist and much experienced, versatile and wideawake man, endowed with qualities that stood him in good stead when he began his book at a remarkably late period in life for the inception of new literary enterprises. His English, if careless, was easy and unaffected, his methods of narration were straightforward, and he had not only a very large knowledge of character and of the details of life but an exceptional power of lending vividness and reality to whatever he described. This last he attained chiefly through a skilful use of minute features and circumstances, which beguile the reader into belief of all he is told. It may be at bottom a journalistic faculty, but, as Defoe seems to be the only professional journalist who has a ‹Robinson Crusoe,› a ‹Moll Flanders,› and a ‹Journal of the Plague Year› to his credit, it would seem either that he was a good deal more than a journalist, or else that critics need to revise their notions as to what the term «journalistic» should connote.

We have already seen that Defoe had made some mild attempts at semi-fictitious writing before the second edition (1718) of Woodes Rogers' ‹Cruising Voyage› brought, in all probability, the story of Selkirk, much in evidence six years before, once more to his attention. An omnivorous reader, he undoubtedly knew the work of preceding picaresque writers, like the author of ‹The English Rogue,› as well as that of Mrs. Aphra Behn, but in the main his contribution to English fiction was original. He had learned early as a pamphleteer to narrate and to describe in a lifelike fashion — *vide* his ‹True Relation of the Apparition of one Mrs. Veal› (1706) — and he had also learned to manage dialogue and to tell anecdotes effectively. Later he had learned how to construct books of some length and to make them less and less sprawling; he had even begun to create characters and to move in imagination in foreign countries and in the past — *vide*, his ‹History of the Wars› of Charles XII of Sweden (1715) and his ‹Continuation› of the famous ‹Letters› supposed to be written by a «Turkish Spy» (1718). Shorter pieces more specifically fictitious might be added to these, but the main point is that he had gradually, probably without knowledge of it or conscious purpose of any sort, been assembling the qualities and materials necessary to the writing of fiction. The story of Selkirk supplied the occasion, the spark, and Defoe was doubtless influenced also by the facts that he now lived at home, being no longer sent by the government on tiresome journeys, and that, writing as he did with great ease, the more books he could produce, the more money he could lay by to furnish dowries for several daughters, to whose attractiveness one of his future sons-in-law, the naturalist. Henry Baker, has borne testimony. In some such uninvolved and human way, we may imagine, one of the most uninvolved and human books ever written came into existence, and it was in giving this book, not merely to his countrymen, but to the world, and in showing other writers what it was to be uninvolved and human in their stories that Daniel Defoe proved himself to be a benefactor to the race. To the student he is in his mixed character and in his perplexing career one of the most interesting of men; to the masses of mankind he is and will always remain «the Author of Robinson Crusoe,» a name and little else. The thing created has swallowed its creator, which is not far from being the highest tribute that can be paid to any achievement.

Convenient editions of ‹Robinson Crusoe› may be found in the Globe, Golden Treasury and other well-known series, and in the late George A. Aitken's edition of Defoe's ‹Romances and Narratives.› The text of most editions, however, leaves much to be desired. The writer has endeavored to supply an accurate text of the first part in a school edition published in 1916 by Ginn and Company, and he has an edition of the same part with full apparatus in the press of the same firm.

W. P. TRENT.

**ROBLIN,** rŏb′lĭn, SIR **Rodmond Palen,** Canadian statesman: b. Sophiasburgh, Ontario, 15 Feb. 1853. He was educated at Albert College, Belleville; settled in Manitoba in 1880; and engaged in farming on an extensive scale, also becoming a grain merchant. He was elected to the Manitoba legislature in 1888, and in 1900–13 was Premier, Minister of Agriculture and Railway Commissioner for that province. He was an opponent of the projected Reciprocity Agreement with the United States in 1911. In 1912 he was knighted.

**ROBSON, Eleanor Elsie** (MRS. AUGUST BELMONT), American actress: b. Wigan, Lancashire, England, 1879. She was graduated at Saint Peter's Academy, Staten Island, N. Y., in 1897 and made her stage début at San Francisco in that year. She achieved a success in New York as Bonita in ‹Arizona,› and later played leading parts in many successful productions. She played Juliet to Kyrle Bellew's Romeo in 1903 and headed an all-star cast in ‹She Stoops to Conquer› in 1905. She starred in ‹Merely Mary Ann› in 1903–05, winning high praise in both London and New York; and won her greatest success in ‹The Dawn of a To-morrow› in 1908–10. She retired from the stage upon her marriage in 1910.

**ROBURITE,** an explosive patented by Dr. Roth in 1887. It consists of dinitrochlor-benzene mixed with ammonium nitrate, and must be used dry. The detonation of the mixture is to be effected by means of fulminate of mercury. Roburite burns quietly, and is not sensitive to shock. Its most successful use has been in the mining of coal, where it is valuable not only because it causes little dust, but also because it allows of blasting the coal in large blocks.

**ROBUSTI,** rō-boos′tē, **Jacopo.** See TINTORETTO.

**ROC,** rŏk, a mythical bird of enormous size, supposed to have been able to perform wonderful feats of strength and ferocity. The most popular accounts of the roc are given in ‹The Arabian Nights' Entertainments,› where the bird plays an important part in the fortunes of Sinbad the Sailor. Sinbad describes the roc as white, with a claw as large as the trunk of a large tree and with a beak of prodigious size and sharpness. Its egg he declares to be 50 paces in circumference, about 150 feet. Another writer computes that the egg of the roc is equal to 150 hens' eggs. The bird is described as a bird of prey, «able to bear an elephant away in its talons,» and «killing the moa, which it bore to its nest and destroyed to provide food for its young.» Consult ‹The Arabian Nights' Entertainments› for the accounts of the second voyage, and the third Calendar's Story. Attempts have been made to identify the roc with the so-called elephant-birds of Madagascar and New Zealand, but it is asserted by naturalists that neither this huge bird (which is not a bird of prey) nor the *Harpagornis,* the largest known rapacious bird, could have performed the feats commonly attributed to the roc. There were described to the Parisian Academy of Sciences the fossils of an enormous bird called the *Æpyornis* and two of its eggs, fossil remains of which had been discovered. (See reports for first quarter, 1851). This little-known colossal form has been accepted as the nearest approach to the fabulous roc. Consult Lane, E. W., ‹Arabian Nights' Tales and Anecdotes› (London 1845), and Yule, Sir Henry, in ‹Book of Marco Polo› (ib. 1871).

**ROCA,** rō′kä, **Julio Argentino,** Argentine statesman: b. Tucuman, Argentina, 1 July 1843; d. 1914. He was trained in the Paraná Military School, entered the army and in 1874 became general. In 1878–80 he was War Minister, and as such headed in person the expedition which subdued the Patagonian Indians. From 12 Oct. 1880 to 12 Oct. 1886 he was President of the republic. It was during his administration that the serious Argentine financial crisis occurred. In 1890–92 Roca was Minister of the Interior in the Pelligrini administration. He was elected President for a second term in 1898, and during the ensuing six years promoted a sound financial policy, furthered public improvements and averted a crisis with Chile. He was sent as Ambassador to Brazil in 1904 and later held a similar post at Paris.

**ROCAFUERTE,** rō-kä-foo-ār′tä, **Vincente,** South American statesman: b. Guayaquil, Ecuador, 3 May 1783; d. Lima, Peru, 16 May 1847. He was educated in France and England, and in 1812 was elected to the Spanish Cortes by Guayaquil, but his opposition to the policies of Ferdinand VII was resented and he was obliged to escape to France. He went to Lima, and to the United States in 1819, and in 1824 to Mexico, where he became secretary to General Michelena. He accompanied him to England, and after the recognition of Mexico's independence and Michelena's return he remained in England as charge-d'affaires. In 1830 he resigned and returned to Mexico, where he edited the *Fénix de la Libertad.* He went to Guayaquil in 1833, and was soon after elected deputy to Congress for the province of Pichincha, but was exiled because of his opposition to the administration. The province of Guayaquil then revolted against General Flores and proclaimed Rocafuerte as supreme chief. He was defeated and captured by Flores, but an amicable arrangement was soon afterward made, co-operation in the reorganization of the republic was agreed upon and Rocafuerte served as President in 1835–39. His administration was one of ability. He introduced many reforms and placed the financial affairs of the country on a sound basis. His after life was spent in various diplomatic missions, in which he sustained his high reputation as a statesman. He wrote ‹Idéas necessarias á todo pueblo independiente, que quiere ser libre› (1820); ‹Ensayo sobre tolerancia relegiosa bajo el aspecto politico y como medio de colonizacion y de progreso› (1831), etc.

**ROCAILLE,** rō-kal-ē'. See Rococo.

**ROCAMBOLE,** a perennial species of onion (*Allium scorodophrasum*) whose bulbs resemble those of the garlic; but the cloves are smaller. It is cultivated for the same purposes, and is considered more delicate flavored. Its chief use in America is among the French-Canadians.

**ROCHA PITTA, Sebastiãno,** sā-bäs-tē-ä'-ñoo rŏsh'ä pēt'tä, Brazilian author: b. Bahia, Brazil, 3 May 1660; d. near there, 3 Nov. 1738. He was a leisurely student, and the author of some commonplace verse and fiction. He made very elaborate preparations for his ‹Historia da America Portugueza desde o seu Descobrimento até o Anno 1724› (1730), which won for him deserved success and numerous honors. The book was the first history of Brazil in any true sense, and the material it contained has proved of much value to subsequent workers in that field.

**ROCHAMBEAU,** rō-shäṅ-bō, **Jean Baptiste Donatien de Vimeur,** Comte de, French marshal: b. Vendôme, 1 July 1725; d. Thoré, 10 May 1807. He was the son of the governor of his native town and was brought up for the Church, but at 17 entered the army. He fought with distinction in the war of the Austrian Succession, attained the rank of colonel and in 1749 succeeded his father as governor of Vendôme. During the Seven Years' War he did excellent service in Minorca (1756) and later in Germany, winning the rank of brigadier-general. He was made lieutenant-governor in 1780 and in the same year was dispatched at the head of an army of 6,000 men to co-operate with the American forces in the War of Independence. In July he landed in Rhode Island and, intrenching himself at Newport, held his position until June of the following year, when, in pursuance of a plan of campaign arranged between Rochambeau and Washington, the French troops, reinforced by some 3,000 men, marched across Connecticut and joined the American army on the Hudson near Dobbs Ferry, whence was begun the southward march for Yorktown. The city was invested on 29 September and after two brilliant assaults by the French troops and the defeat of the English fleet by the French under De Grasse in Chesapeake Bay, Cornwallis surrendered. Rochambeau's services to the American cause were enhanced by the utter absence of jealousy or self-assertion on his part; he placed himself implicitly under Washington's orders and within his own army maintained the sternest discipline. Congress voted its thanks to the French commander for his valuable services and presented him with two guns taken at Yorktown. Returning to France in 1783, he took part in the earlier events of the French Revolution and after being raised to the rank of field-marshal was given in 1791 command of the Army of the North. Regarding with disfavor the progress of the Revolutionary policy, he resigned in June 1792 and soon after was imprisoned at Paris, regaining his liberty at the end of the Reign of Terror in 1794. In 1804 Napoleon made him an officer of the Legion of Honor. A statue of Rochambeau was erected at Vendôme in 1899 and a replica of it, a gift of the French republic to the United States, in Lafayette square, Washington, was unveiled with much ceremony in 1902 by President Roosevelt. He left behind him ‹Memoires du Maréchal de Rochahbeau› (1890), translated, in part, into English by M. W. E. Wright (1838) under the title ‹Memoirs of the Marshal Count de Rochambeau Relative to the War of Independence of the United States.› For his correspondence during his term in America consult Daniel, ‹Histoire de la participation de la France à l'établissement des Etats Unis d'Amérique› (Vol. V, Paris 1892). Consult also Gachot, ‹Rochambeau› (in *Nouvelle Revue,* Paris 1902); Jusserand, J. A. A. J., ‹Rochambeau in America› (Washington 1912); Lodge, Henry C., ‹A Fighting Frigate and Other Essays› (New York 1902); ‹Rochambeau› (published by the Joint Commission on Library of the United States Congress, Washington 1907); Soulé, Françoise, ‹Histoire des troubles de l'Amérique anglaise› (Paris 1787); and the anonymous work, ‹Journal des opérations du corps français sous le commandement du comte de Rochambeau,› sometimes attributed to Rochambeau.

**ROCHDALE,** roch'dāl, a market-town and Parliament borough, England, in Lancashire, 10 miles north-northeast of Manchester. The parish church of Saint Chad, finely situated on a lofty height and approached from the lower part of the town by a flight of 122 steps, is a spacious and venerable structure of the 12th century (restored in 1837), partly in the late Norman and partly in the Perpendicular style, with a square embattled tower, several windows of rich tracery and some very ancient monuments. Rochdale is a place of considerable antiquity, and had a Roman station in its vicinity. Its woolen manufacture appears to have been introduced by the Flemings in the reign of Edward III, and having continued to flourish is mentioned as famous in the reign of Elizabeth. The Rochdale Co-operative Store, which has several branches in the town, was the first society of its kind, and has served as a model for other co-operative societies. There is a monument to John Bright, a native of Rochdale. Pop. 91,428. Consult ‹Victoria History of the County of Lancaster› (8 vols., London 1906–14).

**ROCHDALE PIONEERS,** or **ROCHDALE SOCIETY OF EQUITABLE PIONEERS.** See Co-operation.

**ROCHE,** rōch, **Alexander,** Scottish artist: b. Glasgow, 17 Aug. 1861; d. Edinburgh, 10 March 1921. He began life as an architect, but turning to painting, studied at Paris under Boulanger and Lefebre. He painted in landscapes and genre, and among his pictures are ‘Tête-a-Tête,’ which carried off a gold medal at Munich in 1889; ‘Fishers’ (1891), bought by the Berlin Gallery; ‘Landscape,’ awarded a gold medal at Dresden (1897); ‘Prue’ (1902), bought by the Munich Gallery; ‘The Window Seat’ (in Carnegie Institute, Pittsburgh); ‘Spring’; ‘Low Tide’; ‘Old Song’ (in Stuttgart Public Museum); ‘Margaret’ (in Scottish National Gallery, Edinburgh); ‘Building of the Ship’ (1905, in Dublin Gallery); ‘Old Harbor’ (1907); portraits of Mrs. Andrew Carnegie and daughter (1903) and Miss Flora Stevenson (in Edinburgh Gallery); ‘The Prison Gate, Magadar’ (1916). Roche was elected to the Royal Scotch Academy in 1900. He also painted the frescoes in the Banqueting Hall, Glasgow Municipal Building, 1900. He published ‘Finish in Art’ (‘Transactions’ of the National Association for the Advancement cf Art, 1889) and several essays and lectures on art subjects.

**ROCHE, James Jeffrey,** American author and editor: b. Mountmellick, Queen's County, Ireland, 31 May 1847; d. Berne, Switzerland, 3 April 1908. He was educated at Saint Dunstan's College, Charlottetown, Prince Edward Island. In 1883–90 he was assistant editor of the Boston *Pilot* and editor-in-chief 1890–1905. He was United States consul at Genoa, Italy, 1904–07 and at Berne 1907–08. He published ‘Songs and Satires’ (1886); ‘The Story of the Filibusters’ (1891); ‘Her Majesty the King’ (1898); By-ways of War’; ‘Sorrows of Sap'ed’ (1904), etc.

**ROCHE, Regina Maria (Dalton),** Irish novelist: b. south of Ireland about 1764; d. Waterford, 17 May 1845. She attained sudden fame in 1798 by the publication of her four-volume story, ‘Children of the Abbey,’ much in the fashion of the ‘Mysteries of Udolpho,’ which it rivaled in popularity. She then set to work on a long series of similar books — ‘The Nocturnal Visit’ (1800); ‘The Tradition of the Castle’ (1824); ‘The Nun's Picture’ (1834), and a dozen others.

**ROCHE,** rōsh, **Troilus de Mesgouat,** Marquis de la, French colonizer in America: b. France, 16th century; d. Brittany, after 1600. In 1598 he received from Henry IV letters patent creating him lieutenant-general of Canada and adjacent islands, with power to establish colonies anywhere in North America. With a crew drawn largely from French prisoners, he set sail with one Chefdhotel of Normandy as pilot. After landing 40 of his force on Sable Island, he explored Acadia. Head winds prevented a landing at the island, on his return, and he sailed on for France, where he was impressed for a year. Chefdhotel was ordered to go in search of the 40 followers, who had fortunately made their escape by means of wrecked vessels found on the coast. Consult Champlain, Samuel, ‘Voyages’ (in Publications of the Prince Society, Vols. XI–XIII, Boston 1878–82) and Parkman, Francis, ‘France and England in North America’ (Boston 1898).

**ROCHE-SUR-YON, La,** formerly Napoléon-Vendée and Bourbon-Vendée, a town in France, the capital of the department of Vendée, 40 miles south of Nantes, situated on a hill on the right bank of the Yon. The streets nearly all end in a spacious square, bordered with ranges of fine trees and surrounded by public monuments and elegant mansions. The parish church, with a peristyle of six Doric columns and the maire, or mansion-house, an elegant Italian building, are both in the square. There is an active trade in woolen cloth and hardware. Yon was founded by Napoleon I on the site of the ancient castle of Roche-sur-Yon, destroyed at the Revolution, and received the name of Napoléon-Vendée, which was changed to Bourbon-Vendée at the Restoration and to its present name on the dissolution of the Second Empire in 1870. It contains an equestrian statue of Napoleon I and a museum. Pop. 14,885.

**ROCHEFORT, Henri,** ŏṅ-rē rōsh-fōr (Victor Henri, Marquis de Rochefort-Luçay), French journalist and politician: b. Paris, 30 Jan. 1830; d. 1 July 1913. He became known as the author of successful vaudevilles and farces and as a contributor to *Charivari, Figaro* and other Parisian periodicals, wherein his political reviews were marked by a brilliancy of wit and audacity of attack that brought upon him the resentment of the government. His assaults on Napoleon III led the emperor to demand his expulsion from the staff of *Figaro*. Rochefort thereupon (1868) founded a weekly of his own, *la Lanterne,* in which he continued his assaults on the government with unrivaled weapons of sarcasm and ridicule, beneath which the emperor and his ministers were helpless. The *Lanterne* attained an enormous circulation and when the editor was forced by repeated sentences of the courts to take refuge in Belgium, he continued its publication in a spirit all the more acrimonious. In 1869 he was elected to the Corps Législatif and established the *Marseillaise* with the professed object of combating the Second Empire. In January 1870 he was imprisoned for inciting to insurrection. After the fall of the empire he became a member of the government of national defense, but was out of sympathy with the conservative tendencies of that body and strongly inclined to the radical element that afterward brought forth the Commune. In May 1871 Rochefort fled from Paris, but was captured and sentenced by a court-martial to deportation. In 1873 he was transported to New Caledonia, but escaped in the following year, lived in Belgium and Switzerland and renewed the publication of the *Lanterne.* In 1880 he returned to Paris and founded the *Intransigeant,* a periodical of virulent protest. He was deputy in 1885–86, became an ardent supporter of Boulanger and in 1889 was sentenced to imprisonment, but escaped to England. He returned under amnesty in 1895 and attracted public attention as one of the most violent opponents of Captain Dreyfus (q.v.) in that celebrated affair. He published ‘Les français de lâ décadence’ (1866); ‘La grande Bohême’ (1867); ‘Les petites mystères de l'Hôtel des Ventes’ (1862); ‘Les naufrageurs’ (1876); ‘L'Evade’

(1880); ‹Les dépraves› (1882); Napoléon dernier› (1884); ‹Les Aventures de ma Vie› (Paris 1896). Consult Macdonald, J. F., ‹Personal Recollections of Rochefort› (in *Contemporary Review,* Vol. CIV, London 1913).

**ROCHEFORT, or ROCHEFORT-SUR-MER,** France, chief city of an arrondissement of the department of Charente-Inférieure. It is notable for its naval and army institutions and its well-built public works. It has two harbors — military and commercial. Napoleon purposed embarking for America from this point, but his plans were frustrated. The manufactures include tiles, beer, candles, artifical flowers, naval clothing. There are also various metal foundries, etc. Shipbuilding is also important. The wharves, magazines, dockyards, munition works, etc., are well planned and are now almost entirely modernized.

**ROCHEFOUCAULD,** rōsh-foo-kō, **François,** Duc de la. See La Rochefoucauld.

**ROCHEGROSE, Georges,** zhōrzh rōsh-grōs, French painter: b. Versailles, 1859. He studied at Paris and developed under Lefebvre and Boulanger a powerful naturalistic style with an almost startling brilliancy of technique. His tendency to the brutal side of tragedy in his choice of subjects is, however, frequently revolting and his pictures too frequently swim in blood. Among the best known and most characteristic are ‹The Death of Geta, Emperor of Rome,› and ‹The Fall of Babylon.› Others of like nature are ‹Vitellius›; ‹Andromache›; ‹La Jacquerie,› and ‹Barbarian Ambassadors before Justinian.› Of another kind are his mural decorations of the Sorbonne, ‹The Red Delight›; ‹Knight among the Flowers›; illustrations for ‹Salammbô,› and ‹Herodias.› In 1892 he became an officer of the Legion of Honor.

**ROCHEJACQUELEIN,** rōsh-zhäk-lăn̄, **Henri de la.** See La Rochejacquelein.

**ROCHELLE,** rō-shĕl′, Ill., city in Ogle County, on branches of the Chicago, Burlington and Quincy, the Chicago, Milwaukee and Saint Paul and the Chicago and Northwestern railroads, about 70 miles west of Chicago and 150 miles north of Springfield. It is the commercial and trade centre of a fertile agricultural region, in which stock-raising is an important industry. The manufacturing interests are connected with farm products. It has a high school, public elementary schools and a public library. Pop. (1920) 3,310.

**ROCHELLE, La,** la rō-shĕl, France, chief town of the department of Charente-Inférieure, a fine port and strongly fortified, 120 miles from Bordeaux. Rochelle played an important rôle in the Reformation period, resisting many assaults, but was finally forced by famine to succumb (1628). It has a fine town hall begun in 1486, an 18th century cathedral, exchange, courthouse and the «House of Henry II,» a lycée, old episcopal palace now used as a library and picture gallery, teachers' training school, academy of fine arts, botanical gardens and a museum. Its manufactures include porcelain, textiles, sugar and glass. Pop. 36,371.

**ROCHELLE SALT,** sodium potassium tartrate, a white crystalline substance, discovered by Seignette, an apothecary of Rochelle, France, in 1672. It has a mildly saline and slightly bitter taste, and is much used as a laxative, especially in seidlitz powders. Its formula is $KNaC_4H_4O_6 + 4H_2O$.

**ROCHESTER,** rŏch′ĕs-tėr, **John Wilmot,** 2d Earl of, English poet and courtier: b. Ditchley, Oxfordshire, 10 April 1647; d. Woodstock Park, Oxfordshire, 26 July 1680. On his father's death in 1658 he succeeded to his titles and estates, the latter of which he soon dissipated. Having studied at Oxford, he served with credit in the fleet under Lord Sandwich at the attack on Dutch ships in the harbor of Bergen, but subsequently gave himself up to dissipation and became the personal friend and favorite of Charles II, who is said to have encouraged and shared many of his exploits. He frequently fell into disgrace at court, though his pardon was not long in forthcoming. His constitution at length gave way, and at 30 he was visited with all the debility of old age. He lingered for some time in this condition and died after sending for Bishop Burnet and professing great penitence for his misspent life. The volume of obscure verse purporting to be his contains much that is spurious. He was no better and rather worse than the lax writers of his day; but the edition of his poems brought out by his friends in 1691 contains such exquisite lyrics as entitle him to rank as the best song writer between Carew and Burns. He wrote the famous epigram on Charles II, asserting he «never said a foolish thing and never did a wise one.» Consult Burnet, ‹Some Passages in the Life and Death of John Wilmot, Earl of Rochester› (1680), and Longueville, Thomas, ‹Rochester and Other Literary Rakes of the Court of Charles II› (New York 1903).

**ROCHESTER, Nathaniel,** American pioneer: b. Cope Parish, Westmoreland County, Va., 21 Feb. 1752; d. Rochester, N. Y., 17 May 1831. Having gone in 1763 to Granville County, N. C., he was made a member of the committee of safety for Orange County in 1775, in 1776 was a member of the first provincial convention in North Carolina and was appointed by the convention a deputy commissary-general of military and other stores. He soon afterward resigned and was elected to the North Carolina legislature. In 1783 he established various manufacturing enterprises at Hagerstown, Md., and in Maryland became a member of the assembly, judge of the County Court and a Presidential elector. Independently and in association with others, he purchased tracts of land in western New York, including (1802) one of 100 acres in Falls Town, now in the heart of Rochester. He removed (1810) to Livingston County, near Dansville, and (1815) to Bloomfield, Ontario County. In April 1818 he went to Falls Town, which had been named Rochester in his honor; and in 1821–22 was the first representative of Monroe County in the State legislature. Consult Rochester, Nathaniel, ‹Early History of the Rochester Family in America› (Buffalo 1882).

**ROCHESTER,** England, in the county of Kent, a river port on the Medway, 26 miles southeast of London. Its ancient castle (11th century) on an eminence overlooking the river commands the view of a vast expanse of the surrounding country. The great tower of this ruined castle is one of the finest specimens of

Norman architecture extant. It was restored in 1900. The castle and grounds are the property of the municipality, and the latter have been made into a public garden. The cathedral, founded by Saint Augustine in 604, presents a mixed style, as it was destroyed by the Danes, and parts were added and remodeled subsequently at various epochs. There are many monuments of great antiquity. Of secular buildings, the town-hall, exchange, municipal buildings and almshouses, schools and Working Men's Institute are the most important. There is a large shipping trade, a steam-engine plant and other industrial establishments, and lucrative oyster fishing. The town was founded by Ethelbert. The castle was built by Henry III. Henry VIII visited Rochester, accompanied by Charles V, and Elizabeth spent five days there in 1573. Dickens introduces Rochester into ‹Pickwick,› ‹Edwin Drood› and others of his novels. The city is on the site of the ancient Durobrivæ. Pop. 31,384.

**ROCHESTER,** Ind., city and county-seat of Fulton County, on an outlet of Lake Manitou, 98 miles north of Indianapolis, on the Erie and the Lake Erie and Western railroads. The city was chartered in 1832 and is situated in a productive agricultural district. Industries include bridge works, canneries and manufactures of machinery. Pop. 3,720.

**ROCHESTER,** Minn., city and county-seat of Olmstead County, on the Zumbro River, and on the Chicago and Northwestern and the Chicago Great Western railroads, about 90 miles southeast of Saint Paul and 49 miles west of Winona. It was settled in 1854 by James Bucklin and Mr. Proudfoot, and incorporated as a city in 1858. Rochester was visited by a cyclone in 1883, which caused the death of 27 persons and the loss of a large amount of property. It is in a productive agricultural region, corn, barley, clover being among the principal crops. Considerable attention is given to stock-raising. The chief manufacturing establishments are flour and grist mills, a foundry, the Sears-Roebuck camera factory and machine shops. There are large grain elevators and stock yards. The principal buildings are the courthouse, municipal building, Masonic Temple, Odd Fellows' building, Metropolitan Theatre, Mayo Clinic, Colonial, Worrell and Stanley hospitals, Kahler Sanitarium, the Rochester State Hospital for the Insane, Saint Mary's Hospital, Zumbro Hotel, a number of churches and the convent of the Sisters of Saint Francis. The educational institutions are the high school, public and parish elementary schools, private commercial schools, Notre Dame de Lourdes Academy (R.C.), founded in 1877, and four libraries. The city is the home of the famous surgeons, Charles and William Mayo (q.v.), who founded the Mayo Clinic. The five banks have a combined capital of $1,000,000; and the annual business amounts to nearly $6,000,000. The city has constructed a million-dollar hydro-electric plant on the Zumbro River 14 miles north of the city. Seventy thousand persons annually visit Rochester for health. The government is vested in a mayor, alderman-at-large and a council of six members, three of whom are chosen by popular vote each year. Pop. 15,000.

**ROCHESTER,** N. H., city in Strafford County; on the Cocheco and Salmon Falls rivers, and on the Boston and Maine Railroad; about 30 miles east by north of Concord, and 35 miles northeast of Manchester. It was settled in 1722 by emigrants from England; incorporated as a town in 1722 and chartered as a city in 1891. It is the commercial and industrial centre of a large part of Strafford County; the chief manufacturing establishments are shoe factories, woolen mills, brick yards, box factories and other industries. The trade is chiefly in its own manufactures and in farm products. The principal public buildings are the Gaffney Home for the Aged, several churches and the schools. The educational institutions are a high school, public and parish schools, private commercial schools, and a public library. The government is vested in a mayor and a council of 18 members who hold office for three years, six being elected each year. Pop. (1920) 13,722. Consult McDuffee, ‹History of the Town of Rochester› (Manchester, N. H., 1892).

**ROCHESTER,** N. Y., city and county-seat of Monroe County, is situated on Lake Ontario, the Genesee River and the Barge Canal. It is reached by the following railroads: New York Central and Hudson River, West Shore, Lehigh Valley, Erie, Buffalo, Rochester and Pittsburgh and the Pennsylvania. It has two car ferries to Coburg, Ontario, making round trips daily throughout the year; is an important coal shipping port and a point of call for passenger steamers in the Toronto, Kingston, Thousand Islands, Montreal and Quebec trade. It is 228 miles west of Albany. The city lies on a plateau 263 feet above Lake Ontario, is built on both sides of the river, and almost in the centre of the city are the Upper Falls of the Genesee. There are two falls within the city limits. Midway through Rochester runs the Genesee, which is spanned by 10 bridges within the city limits, the middle one of which, built of stone, is enclosed by stores on both sides, but the others, of iron construction on stone piers, are open, affording beautiful and diversified views of the river, particularly from Driving Park Avenue bridge, whence can be seen a winding gorge nearly 200 feet deep. The sides of this show several distinct geological strata revealing the gradual formation of the earth, the red Medina sandstone being plainly visible as it rises from the water's edge for more than half the height of the precipice, when it gives place to successive layers of green shale, limestone, hematite iron ore, green and purple shale, and finally a topmost crust of limestone, all belonging to the Upper Silurian Age. At the point referred to are the Lower Falls, about 80 feet high, a curtain of water most beautiful, though less imposing, than the principal cataract, two miles further back, in the centre of the city, from which, with its sheer descent of 96 feet, Sam Patch (q.v.) jumped to his death in 1829.

**Barge Canal.**— Crossing the city from east to west is the new Barge Canal which succeeds the Erie Canal constructed in 1825, and which for many years after its construction was the great highway of commerce through the State. The old canal crossed the river by means of an aqueduct of fine proportions, built of Lockport limestones at a cost of $600,000. The canal at

1 The Falls of the Genesee, Upper Falls

2 The Falls of the Genesee, Lower Falls

this point is 506 feet above sea-level tide-water. The Barge Canal passes through the city about three miles to the south of the old canal and has a commodious harbor in conjunction with the Genesee River. The river is dammed for this purpose a little south of the Court Street Bridge.

**Parks.**— The Rochester park commission was created in 1888, since when work has been done so judiciously by the aid of the best landscape architects and nurserymen, taking advantage of the rolling lands that were obtainable, that few cities present so attractive an appearance in this regard. The total area of park territory is 1,649 acres, and the five largest parks, in their order, are Durand-Eastman, Genesee Valley, Seneca, Maplewood and Highland. Highland Park contains one of the finest arboretums in the country, and Durand-Eastman Park is located on Lake Ontario, and has the advantages of forest, field and stream.

**Public Buildings.**— There are four well-equipped hospitals, the General, Saint Mary's, Homœopathic and Hahnemann; a Municipal Hospital for contagious diseases, Iola Sanitarium for tubercular patients, Infants' Summer Hospital at Lake Ontario, the insane asylum or State Hospital, the County Hospital for free patients and a splendidly equipped dental dispensary, the gift of some of Rochester's public-spirited citizens. There are numerous hotels, many of them new and modern, of which the largest are the Powers, Rochester, Seneca, Whitcomb and the Osburn. Of late years, apartment houses have become popular and many have been built or are in process of construction. There are several theatres and motion picture houses, most prominent of which are the Lyceum, Temple, Family, Fay, Gayety, Piccadilly, Regent, Gordon and Rialto.

**Newspapers.**— There are several daily newspapers, the chief of which are *Democrat and Chronicle, Herald, Times-Union* and the *Post-Express,* and a large number appearing less frequently.

**Clubs.**— Of the social clubs the principal are the Genesee Valley, Rochester, Masonic, Whist, Elks, Physicians and University. There are three well-equipped country clubs, the Oak Hill, the Country and the Irondequoit; the first located near Genesee Valley Park, the second about two miles east of the city and the third still farther east. There is also a flourishing women's club, the Century. The Genesee Golf Club is located in Genesee Valley Park and has a large well-equipped clubhouse. The leading literary clubs are the Alembic, Pundit, Fortnightly and the Wednesday Morning.

**Manufactures.**— Rochester was built up by the milling industry. The quality and amount of wheat grown in the valley during the early days made a demand for flouring mills, which was strengthened by the presence of the high falls, so that those structures sprang up rapidly on both banks of the river and became so numerous that the place was long known as «the Flour City» and its pre-eminence in this respect was recognized throughout the country. The development of the enormous wheat-fields of the West caused a decline in this business, so that its relative position was taken by the nursery industry; this was started here in 1838, after which it increased so that in 1904 there were more than 30 firms engaged in the business; besides the nurseries there are several large seedhouses, Rochester being the foremost city in the world in this regard. It is now called «the Flower City.» The first trees sent to California went from here in 1849. Rochester is the home of the camera and is often called «the Kodak City.» It leads the world in the manufacture of photographic goods and supplies, soda fountain fruits and syrups, enameled steel tanks, filing devices and office systems, thermometers, optical goods and check protectors. Because of the wide range of articles manufactured, it is known as «the City of Varied Industries» and has adopted as a slogan, «Rochester Made Means Quality,» as practically all of the goods manufactured are of the highest grade. Sixty per cent of the carbon paper and typewriter ribbon made in the United States are manufactured in Rochester and the city leads the United States in the manufacture of high class ivory buttons. It is estimated that more than 350 separate commodities are manufactured in Rochester by 1,760 manufacturing establishments. Rochester is one of the largest shoe centres in the United States with 58 factories and an annual output valued at $55,075,000. In the production of clothing, the output in 1918 was valued at $24,000,000 in its 30 clothing factories. Canning of fruit and other foodstuffs is one of the large industries in the city. Although Rochester ranks twenty-fourth in the United States in point of population, it ranks first in the production of many manufactured articles. It is placed third in the production of clothing and has the same rating in the production of boots and shoes. Its total manufactures are valued at $250,000,000. Receipts at the post office in 1918 were $1,730,115.90. The capital invested in manufactures is estimated at $150,000,000 and the total employees in factories is estimated at 125,000. The salaries and wages paid annually approximate $50,000,000. The assessed valuation of property in the city in 1919 was $286,455,240. The tax levy for 1919 is $6,886,165, making a tax rate of $24.065 per thousand.

**Banking and Commerce.**—A most important factor in the commercial and civic life is the Chamber of Commerce, organized in 1888, which now has a membership of 3,300. It is magnificently housed in its own building constructed especially for its use and all of which it occupies. There are 16 banks, including four savings banks, the capital and surplus of which, 1 Jan. 1918, was $21,000,000 and the deposits $208,000,000. The clearings for the last six months of 1918 were $188,449,976.

**Education.**— The Rochester Athenæum and Mechanics Institute — generally known by the latter part of its title — was founded in 1885 as a free drawing school and has so expanded that it now gives instruction in practical arts and sciences to about 1,850 pupils and ranks fourth among the technical trade schools of the country. The University of Rochester, founded in 1850 and located in beautiful grounds in the eastern part of the city, has a faculty of 46 instructors, with 535 students, and a library of 76,800 volumes. There are also the Rochester Theological Seminary, of the Baptist denomination, founded in the same year, with a present faculty of 17, over 100 students and 42,900 books; Saint Bernard's Theological Seminary, occupying capacious grounds north of the city, started in 1893, having now 13 professors, 225 students and over 15,000 volumes. The public school system, under the control of a board of education of seven members, is among the best in the country. It maintains 47 buildings with as many principals and during 1918 there were 1,250 teachers with 39,750 registered pupils. The expenditures of the board for 1918 were $2,301,867.44. There are four high schools, East High, West High, Washington Junior High and Charlotte High. There are also 32 parochial schools and many private ones, including four academies, two of them for girls and two for boys, and one large institution for the instruction of deaf-mutes. The Rochester Public Library operates six branches comprising 75,000 volumes in all; also the Reynolds Public Library with 55,800 volumes, mainly books for reference and consultation.

**Churches and Charities.**— There are 155 churches in Rochester. The first congregation (Presbyterian) was formed in 1815; the Roman Catholic diocese of Rochester was created in 1868. Of the seven cemeteries the oldest is Mount Hope, opened in 1838, remarkable for its natural beauty, owing to the undulations of the ground in every direction. There are five orphan asylums, three of which are under Catholic control, one under Jewish. In 1822 the Female Charitable Society was organized, from which has risen the kindred institutions of to-day, including, besides the hospitals and asylums, the Industrial School, the Home for the Friendless, the Humane Society, the Children's Aid Society, the Society for the Organization of Charity and a host of other associations for relieving distress, the most of which are connected, more or less directly, with the various churches.

**Public Service.**— In 1873 the Holly system of waterworks was introduced for fire protection. In the same year pipes were laid to Hemlock Lake, 28 miles away, by which water that is unsurpassed, possibly unequaled in its purity by any other city in the United States, is obtained for drinking and other purposes; 39,500,000 gallons are delivered daily through conduits; there are within the city limits 452.5 miles of distributing mains, and 5,711 hydrants; the total cost of the works was $12,926,907.19. The street cleaning is done by many water-carts, instead of by the unsanitary means of dust-raising brooms. It is probably owing, partly, to the agencies just described that Rochester is one of the healthiest cities of the Union, the annual death rate during five years averaging 14 to the 1,000. The police force consists of 407 uniformed men; the fire department has 402 men with 17 steamers, 23 hose carts, 10 truck companies and two water towers, and one protective volunteer company. The meteorological records of the 33 years show that the mean annual temperature was 47.3°, and the mean maximum 55.4°; the mean minimum 39.2°, the absolute maximum 99°; the absolute minimum 14° below zero; the mean annual precipitation 34.5 inches, the average number of clear days annually 83, partly cloudy 126, cloudy 156.

Rochester has always been free from overwhelming calamities. The worst two disasters, financially, in its history, in neither of which was a single life lost, were the great flood of 17 March 1865, when much of the city was under water for two days, doing a million dollars worth of damage; and the fire of 26 Feb. 1904, which devastated a large portion of the drygoods district and inflicted a loss of $3,000,000. Rochester has a well-supplied electric street car system with 144 miles of track, besides interurban lines that run in every direction. There are two telephone systems in the city, one a home enterprise.

**History.**— In 1789 a sawmill and grist-mill were built on the west bank of the river by Ebenezer Allan — commonly called «Indian Allan» from his lifelong association with the savages — who received, as compensation for the work, from Phelps and Gorham, the owners of the land, 100 acres surrounding those pioneer structures. Though no settlement was made at the time, that tract became the nucleus of the future city. In 1803 it was bought by Col. Nathaniel Rochester, Col. William Fitzhugh and Maj. Charles Carroll, all of Maryland, for $17.50 per acre. Some scattered dwellings were built in the vicinity within the next few years, but no house was erected in what was then called Rochester, after the first-named proprietor, until 1812, when a log cabin was built on the spot that has ever since been known as the Four Corners. Other residences soon went up, in one of which the first white child was born 2 Dec. 1814. Settlers from the New England States came pouring in and when the first census was taken in December 1815, the population was shown to be 331. In 1817 it was incorporated as a village, under the name of Rochesterville, but in 1822 the title was changed to Rochester. In 1823 the size of the village was augmented by taking in a part of the town of Brighton, on the east side of the river, and subsequent additions have so increased the area that it now embraces over 20,900 acres, with 401 miles of open streets, 290 miles of which are improved, with 380.2 miles of sewers. It was incorporated as a city in 1834, the first mayor being Jonathan Child. Rochester was the birthplace of modern Spiritualism, the famous Fox sisters having given here, in 1849, the first manifestations of mysterious rappings, which speedily became known as the «Rochester knockings.» During slavery times, Rochester was one of the centres of the abolition movement and one of the principal stations of the «underground railroad.» It was the home of Frederick Douglass (q.v.), the celebrated negro orator, and was the place in which William H. Seward (q.v.) in 1858 uttered in a public address his memorable phrase in speaking of the struggle between freedom and slavery as an «irrepressible conflict between opposing and enduring forces.»

The government is vested in a mayor and common council, elected for two years, under a charter of 1908. A comptroller, police justice, assessors, aldermen, school commissioners, etc., are chosen by the people. The city budget is about $6,200,000 yearly.

**Population.**— In 1910 Rochester ranked 23 in the list of cities in the United States. The population in 1820 was 1,502; (1825) 5,273; (1834) 12,252; (1880) 89,363; (1890) 162,608; (1910) 218,149; (1920) 295,750. This shows an increase between 1890 and 1900 of 21 per cent, and between 1900 and 1910 of 34 per cent, and between 1910 and 1920 of 74 per cent.

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Howard Strong,
*Secretary, Rochester Chamber of Commerce.*

**ROCHESTER,** Pa., borough in Beaver County, at the junction of the Ohio and Beaver rivers, and on the branches of the Pennsylvania Railroad, about 25 miles northwest of Pittsburgh. It is connected by electric lines with Beaver, Beaver Falls, New Brighton and other nearby places. A bridge across Beaver River connects the borough with Bridgewater, and one across the Ohio connects the town with Monaca. It is in the coal and oil region, and in the vicinity are deposits of fireclay and building-stone quarries. The chief manufactures are flour, lumber, brick, glassware, foundry products, mining tools, structural iron and oil-well supplies. The principal public buildings are the churches, schools and Masonic Temple. Pop. (1920) 6,957.

**ROCHESTER, University of.** See University of Rochester.

**ROCHESTER PLAN OF EDUCATION.** See Retardation of Pupils.

**ROCHESTER THEOLOGICAL SEMINARY,** founded at Rochester in 1850 by the New York Baptist Union for Ministerial Education. As early as 1847 an attempt was made to remove Madison (now Colgate) University from Hamilton to Rochester, but this was opposed by the Baptists of Hamilton and legal obstacles were found, so that the plan was abandoned. The University of Rochester (q.v.) was established at the same time by the Baptists, and for a time the two institutions occupied the same buildings, but there has never been any organic connection between the university and the seminary, the latter being essentially a professional school. The regular course is three years; instruction is given in the departments of Hebrew language and literature (Old Testament), theology, church history, New Testament, homiletics and pastoral theology, elocution, English Bible and Christian ethics. Graduation from college or preparation in Greek sufficient for the study of the Greek Testament is required for admission; formerly there was an English course for those who had no classical training; this was abandoned in 1889–90. In 1852 a German department was organized; the course is literary as well as theological and covers six years. The seminary was at first without endowment, and at the end of 10 years had only $75,000; in 1917 the productive funds amounted to $1,814,000. The library is one of value, including the whole collection of Neander, the German church historian, and numbering 45,000 volumes. The total number of students was 152 in 1917.

**ROCHET,** a lawn or linen lace garment, somewhat like the surplice in shape, but with close-fitting sleeves or sleeveless, worn by bishops, abbots, prelates and other ecclesiastical dignitaries. Also a ceremonial robe formerly worn by British peers.

**ROCHETTE, Désiré Raoul,** dā-zē-rā rä-ool rō-shĕt, French archæologist: b. Saint-Armand, France, 9 March 1790; d. Paris, France, 3 July 1854. He was educated at Bourges, removed to Paris in 1811, in 1815 became assistant professor to Guizot, whom he afterward succeeded in the chair of history at the Sorbonne. In 1826 he became professor of archæology at Paris, and in 1838 was elected permanent secretary of the Academy of Fine Arts. He gained a wide reputation for learning, was popular as a lecturer and enjoyed high favor after the Restoration. Besides his unfinished history of ancient art he wrote ‹Antiquités du Bosphore Cimmerien› (1822); ‹Tableau des Catacombs du Rome› (1837); ‹Lettres archéologiques sur la Peinture des Grecs› (1840); ‹Mémoire sur l'Acropole d'Athènes› (1845); ‹Mémoires d'Archéologie comparée Asiatique, Grecque, et Etrusque› (incomplete, 1848), etc.

**ROCK-BASS.** See Bass.

**ROCK-BRAKE.** See Ferns and Fern-allies.

**ROCK BREAKING.** See Gold Mining.

**ROCK CLEAVAGE,** a tendency that many rocks have to part more easily along certain parallel directions than in other directions. If this tendency was imparted to the rock at the time of formation it is called primary or original cleavage. Bedding is the usual type of primary cleavage. If the tendency is imparted after the rock has been formed it is called secondary or induced cleavage. Such cleavage is produced by pressure and is usually not parallel to the original bedding planes. If the tendency to part results from many closely spaced fractures it is called fracture cleavage. Frequently, however, there is no actual fracture, but the weakness comes from the arrangement of the mineral particles in parallel directions. This can often be plainly seen in schists which split parallel to the numerous mica plates. This latter type is called flow cleavage. It is well exhibited in schists, gneisses and slates. It is believed to be caused by actual rock-flowage, under intense pressure. See ROCK-FLOWAGE; METAMORPHISM; ROCKS, SCHIST STRUCTURAL GEOLOGY, etc.

**ROCK CRYSTAL.** See QUARTZ.

**ROCK DOVE, or ROCK PIGEON.** See PIGEON.

**ROCK DRILLS AND ROCK DRILLING.** The steam or rock drill is known to-day as an American invention and its inception dates back to the excavation of the Hoosac Tunnel in Massachusetts. This enterprise was fathered during its period of construction by the State of Massachusetts and was beset with enormous difficulties. To begin the excavation of a tunnel five miles long through hard rock and to do the drilling by hand was an audacious proposition. Many methods of excavation were proposed and tried. Machines were built, tested and condemned. Among the inventors, the man who schemed the machine which in general features embodied the requirements of a perforator for making holes for blasting was Mr. Fowle of Boston. He constructed the first machine in which the drill used was made the extension of the piston rod of a reciprocating steam engine, which was moved forward toward the rock as the drilling advanced. The drill had a slow rotary as well as a reciprocating motion to ensure the boring of a round hole. With this beginning machines were improved in details, but operated without notable economy. The drills were heavy and could be used practically only when mounted on heavy carriages running on wheels on a track They were much too heavy for mine or quarry work, although a few were used for such purposes.

Later came a demand for a lighter machine, and the Little Giant and Eclipse machines, both built by the Ingersoll-Rand Company of New York, were found useful. The Little Giant was operated by a positive motion valve and the Eclipse by a piston valve. With the introduction of light drills came various improvements which were found to be invaluable as the scope for the use of the rock drill enlarged. In fact, almost a new drill was made when the machines were applied on a large scale in New York City for outside excavation at a tunnel under 42d street and under Hell Gate, and also in the hard ore mines of Lake Superior.

As soon as the rock drill attained a reasonable state of perfection its improvement was immediately manifested to the world at large. It has often been called the advance agent of civilization, and it undoubtedly has a better claim to that title than any other mechanical invention of recent date. All modern engineering is dependent on its use, and problems which would be impracticable without this machine are rendered easy. Its influence on mining, quarrying, railroading and navigation has been felt all over the world. The rock drill has developed the mines and tunnels of the world. The work done by the rock drill may be said to be from 60 to 150 lineal feet of hole drilled per day of 10 hours in ordinary stone, including shifting and setting up of the drill, cleaning holes, etc. In tests and special cases the figures have been largely exceeded, sometimes as much as 400 lineal feet being made. Records of 24 inches per minute are not uncommon, all, of course, for down holes in favorable rock, but 70 feet per day of 10 hours in granite, including moving and setting up, averages a fair working basis. The cost of drilling in this way may be stated to vary from 2½ to 13 cents per lineal foot, according to local conditions. From four to six cents per foot of hole drilled may be taken as the working figure for general calculations, and this includes all expenses. There are two distinct methods of machine drilling, one the auger drill, which bores the rock, and the other the percussion drill, such as the Little Giant or Eclipse, working by direct impact, that is, by striking repeatedly in the same spot and by simply bruising or chipping away the rock. Experience has proved that a reciprocating drill operates with the greatest economy and efficiency. The following are improvements made in the rock as used to-day:

Beginning with the cylinder of the drill, the method of using long bolts to hold the top and bottom heads in place with an elastic or spring buffer, whereby the blow (struck accidentally upon either head by the piston) is absorbed, may be placed first. The method of gripping the steel and the chuck by means of the «U» bolt and chuck key stands second. The device of flanged and rotating bar dropped through the ratchet box marked a great advance in the art. The use of the taper throttle was also a very neat device for preventing leakage and providing a graduated admission of the working fluid. In passing from the cylinder to its mounting the most important achievement was in the very simple device of mounting the drill on the horizontal arm attached to a vertical column, which in turn was mounted to a block and jacked in place by two screws, one on either end of the block. A kindred invention was the universal joint applied to the legs of a tripod.

**Surface and Underground Work.**— Surface work includes that class of excavation which occurs in open air, and underground operations include such borings as are underground. Surface drilling may be applied for opening up canals, for quarrying purposes, for opening up ways for railroads and similar undertakings. Such work may necessitate the use of tripod, column and shaft-bar, quarrying machines, channelers, gadders and the like. (See QUARRYING). Underground work necessitates the use of rock drills and compressed air machinery for purposes of sinking shafts, opening mines, etc. In shaft sinking and tunnel work, as in driving headings and enlarging, it has been found that the column is the best means of mounting rock drills. These columns are simply round, extra heavy, wrought steel tubes with a suitable claw-foot or rosette on one end and either one or two clamping or jack screws on the other. Stoping bars and tripods are also extensively used for special features.

**Submarine Work.**— Submarine or subaqueous rock excavation is essential for converting shallow rivers and harbors into navigable waterways. The conditions under which submarine rock excavation must be done are difficult to the last degree, calling for special apparatus of unusual strength and endurance. This character of work is nearly always carried on where tides, currents, winds and storms are present in a varying degree, and these elements are practical obstacles to rapid and economical work. Add to these troubles deep water, irregular bottom covered over with mud, sand and other shifting material, which fills in almost as fast as removed, and the undertaking is seen to be extremely difficult. In the early days the usual method was to lower explosives to the surface of the rock and attempt fracturing by surface blasting. Later a form of drop bore was introduced. This system has been abandoned for the more progressive method of drilling a hole and inserting the charge of explosive as is done in rock excavation on land.

The removal of submarine rock is becoming a more important feature owing to the increasing depth of ocean and lake-going vessels demanding deeper channels for harbors and rivers. A barge, scow or float fitted with a suitable frame to support the drill guides, drill, boilers and other auxiliary apparatus, is usually employed in submarine excavation. The barge is towed into place and anchored by means of cables, anchor chains or spuds, or a combination of these methods, depending upon the rise and fall of the tide, or the currents to be encountered. The form of framework depends largely upon the system used to feed the drills down, as the hole is cut into the rock. The height of the frame and the length of feed depend on the rise of tide and the depth of water over the rock and the depth to which the hole is to be drilled.

Various styles of mountings are employed in submarine excavation work. The drills used for such operations are generally of the heaviest tvpe, as the work to be done is always severe and difficult. See DRILL.

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## ROCK-EXCAVATING MACHINERY.

In quarrying the most important machines are the channeler, the gadder, rock drill, air compressor, etc. To meet the varying requirements of different classes of work four styles of track channelers are manufactured.

**Upright Channeler.**— This consists of a truck mounted on four flanged wheels running on a track. Upon this track is carried a boiler (in the steam driven machine) or a reheater (in the air driven channeler) together with a powerful chopping engine mounted at one side on a frame of great strength. At the end of the piston rod of this engine are connected cutting steels which are driven against the rock by steam or air power in the engine cylinder.

**Swing-Back Track Channeler.**— In machines of this type, the frame carrying the cutting engine swings on a hinge joint, giving an angular adjustment up to 45 degrees from the vertical in the bare machine, or 15 degrees in the outfit carrying the boiler or reheater. In addition to this movement the cutting engine swings in the plane of the frame, with an angular range up to 45 degrees either side of the vertical.

**Undercutting Channelers.**— These consist of a heavy frame of cast iron mounted on four wheels, carried on steel axles running in babbitted boxes. At either end of the frame is a special guide shell provided with a swinging adjustment in both horizontal and vertical planes, by means of which all angular conditions may be met and cuts carried clear into the corners. The shells are hung verv low, thus giving the least possible offset in cutting. The use of the two shells permits the channeler to work close to the wall and adapts the machine to deposits of any angle or dip.

The *bar channeler* consists of a carriage supporting the cutting engine mounted on two parallel bars along which it is moved automatically by means of an engine actuating a traveling feet nut. The engine is automatically reversed at each end of the travel; or the stops may be set at any intermediate point.

The *quarry bar* consists essentially of the single bar mounted on four tripod legs, two on either end. On the bar is mounted a carriage which supports the drill and which may be moved along the bar by means of ratchet and pinion and operated by a hand wheel.

The *gadder* consists of a heavy solid cast-iron body mounted on four wheels forming a truck running close to the floor of the quarry. To one end of the truck is hinged a standard or arm which can be swung from nearly horizontal to vertical and firmly locked in any desired position. On the swinging arm or standard is a sliding carriage on which may be mounted, by means of a cone pivot and bolt, any one of several sizes of rock drills, according to the work to be done. To raise or lower the drill and move it along the slide a chain is attached to the saddle and run up and over a shaft at the end of the swinging arm and down to a small drum on which it is wound by turning a crank conveniently placed for the operator. A special taper gib or wedge clamp is fitted on the saddle, wherewith the saddle is firmly locked to the swinging arm by simply throwing down a small lever when the drill has been raised or lowered to the proper position. At each corner of the truck frame is a large pointed steel pin or pointer, slipping freely in a guide socket, and when the machine is properly arranged a blow from a sledge on each of these pins anchors the trucks in place. See AIR COMPRESSOR; ROCK DRILLS; PUMPS, COMPRESSED AIR; PNEUMATIC TOOLS; MINING AND MILLING MACHINERY; COAL MINING MACHINERY; CRUSHING AND GRINDING MACHINERY; QUARRYING; ROCK DRILLS; TOOLS, ETC.

**ROCK FALLS,** Ill., city in Whiteside County, on Rock River and on the Hennepin Canal, the Chicago, Burlington and Quincy Railroad, across the river from Sterling, where connection is made with the Chicago and Northwestern Railroad, about 110 miles west of Chicago. It was settled in 1867 by Augustus P. Smith. It is the commercial and industrial centre of the eastern part of the county south of Rock River. The water power is good; the chief manufactures are wire fencing, rivets, bolts and nuts, box boards, agricultural implements, butter tubs, flour, furniture, woodenware, wagons, carriages, buggies, washing-machines, garden tools, display racks and dairy products. There are several churches, a high school, elementary schools and a public library. The banking resources amount to $390,000; the value of taxable property to $2,000,000, the annual tax levy to $12,000, while receipts from the municipal electric-light plant amount to $10,000. The government is on the commission plan. Pop. 3,000.

**ROCK FEVER.** See MALTA FEVER.

**ROCK-FISH,** the name of several fishes usually found about reefs and on rocky bottom. In the United States the most prominent one is the striped or rock bass (see BASS); another is a grouper (*Epinephelus adcensionis*) of the West Indies, called by English-speaking fishermen «rock-hind.» The name applies on the Pacific Coast to the whole family *Scorpænidæ,* represented in the Atlantic by the dory or rose-fish (*Sebastes marinus*), which looks somewhat like a perch in form, reaches a length of two feet, has a rosy hue and is excellent for the table; it may be known by its nearly uniform orange-red color and its spiny head. The genus *Sebastodes* contains more than 50 species of Pacific Coast rock-fish and several are constantly brought to market. Says Jordan: «*Sebastodes pauci spinus,*» the boccaccio, large and swift, is abundant in California. *Sebastodes flavidus,* the yellow-tail rockfish, reaching a length of two feet, is one of the most valuable species. It is abundant from San Francisco to San Diego. *S. mystinus,* the black rockfish, is the most abundant species in rather shallow water about San Francisco. Another abundant species is the orange rockfish, *S. pinniger,* found from Puget Sound to San Diego. It reaches two feet in length and is a common market fish. The rasher (S. *miniateus*) is another important species, reaching a length of two feet and abundant from San Francisco to San Diego. The red rockfish (*S. ruberrimus*) is the largest species of all, reaching a length of two and one-half feet; it is abundant from San Diego to Puget Sound and is a valued food fish. Another important species is the yellow-backed rockfish (*S. maliger*), which is found from Monterey to Sitka. It is especially abundant northward and reaches nearly two feet in length. The Spanish flag, *Sebastodes rubrovinctus,* banded red and white, is perhaps the handsomest sea fish in our waters.» Consult Jordan and Evermann, ‹American Food and Game Fishes› (1902).

**ROCK-FLOWAGE.** It has been demonstrated that under sufficiently intense pressure, hard rocks can be made to flow. This has been accomplished in the laboratory. Cylinders of marble have been enclosed in hollow brass cylinders and subjected to intense compression slowly applied through a very long time. The brass cylinders were much distorted until they were only about half as long as before and much wider. The brass was then sawed away and the marble was found to have also taken the new shape, but to be as solid and unbroken as it was before. Marble not enclosed in the brass cylinders when subjected to the same pressure broke into little fragments. In the first case the rock flowed, in the second it fractured. Other rocks can be made to behave in the same manner. The pressure necessary to make the marble flow can easily be measured. It can then be figured how deeply rocks would have to be buried to undergo natural flowage due to pressure in the earth's crust. It has been variously estimated that at depths of from 5 to 12 miles the hardest rocks would flow. If so, that is the limit of depth of open cavities and of faults and veins. Below this depth is the zone of flowage; above it, where rocks fracture rather than flow, is the zone of fracture. Flowage is in part due to the solution and recrystallization of minerals. New minerals are often formed with their longer dimensions at right angles to the force, producing flow cleavage. See ROCK CLEAVAGE, METAMORPHISM AND SECTIONAL STRUCTURE in article on GEOLOGY.

**ROCK HILL,** S. C., city in York County, in the northern part of the State, 80 miles north of Columbia, on the Southern Railroad. It is a live commercial and manufacturing centre and contains railroad shops, large hydro-electric plants, public library, Fennell Infirmary, the Winthrop Normal and Industrial College of South Carolina. The region is adapted to a large variety of farm and vegetable produce, specially to cattle-raising, hogs, sheep, poultry, etc. The city's industrial establishments include cotton mills, a bagging factory, knitting mills, automobile factory, fertilizer and oil mills, lumber and planing mills, flour and grist mills, foundries, ice and printing plants, etc. The city owns excellent water, light and sewerage plants. The commission manager form of government with three commissioners and a city manager is in operation. The three banks have combined capital and surplus of $850,000 and deposits of over $3,700,000, including two trust companies. There are five modern school buildings, including a well-equipped high school. There are 19 miles of paved sidewalks and asphalt streets. Pop. (1920) 8,809.

**ROCK HIND.** See ROCK-FISH.

**ROCK-HOPPER,** a rock wallaby or kangaroo (q.v.).

**ROCK ISLAND,** Ill., city, county-seat of Rock Island County, on the Mississippi River and on the Chicago, Rock Island and Pacific, the Chicago, Burlington and Quincy, Rock Island Southern and the Chicago, Milwaukee and Saint Paul railroads, 180 miles west by south of Chicago, opposite Davenport, Iowa, a few miles below Moline and 125 miles, in direct line, north by west of Springfield, the State capital. The city is named after the island in the river between the cities of Rock Island and Davenport. The United States government and the Chicago, Rock Island and Pacific Railroad built a combined railroad and highway bridge from Rock Island city to the island and thence to Davenport. The original cost of this bridge was $1,000,000. Another bridge connects Moline with the island, thus making the three cities («The Triplets») one in many matters commercial and industrial. Rock Island has steamer connections with all the Mississippi ports. The island is three miles long, composed largely of limestone. A government arsenal and armory are located here and represent an investment of about $30,000,000. The grounds cover 1,000 acres. That portion of the river between the island and Davenport is navigable, but on the west side of the island the river has been dammed by the United States government, thus furnishing Rock Island, Moline, the island and Milan (a few miles below the city) with extensive water power, which has contributed to the development of a large and important manufacturing centre. Rock Island has excellent transportation facilities which make it of importance as a commercial city.

The chief industrial establishments are the arsenal in which there are normally 4,500 employees, plow and tractor factory, lumber mills, petroleum wax-plant, paint factory, oilcloth factory; brick, gas engine, lumber, stove works; soap, electrical appliance, storage battery and plumbing fixture works; sash and door and building materials factories, etc. The prominent public buildings are the government arsenal, the courthouse which cost $175,000; the high school, $125,000; the library, $75,000; Saint Anthony's Hospital; the 20 churches and a number of fine business blocks. The Davenport mansion, on the island, is of historic interest. The educational institutions are Augustana College (Lutheran), opened in 1860; Vila de Chantal (Sisters of the Visitation), public and parish schools, several private schools, one city library and three school libraries. The five banks have a combined capital approaching $1,000,000. The government is conducted on the commission plan.

Rock Island was settled in 1826 by Col. George Davenport. It was platted in 1835 and called Stephenson. In 1841 it was united with Farnhamesburgh under its present name, and in 1849 was chartered as a city. When Colonel Davenport built his home on the island in 1833 the neighboring places were a fort and an Indian trading post. Prior to his settling in this locality, in 1826, he had been there in 1816 with the government troops, when Fort Armstrong was established. Black Hawk, the Indian chief, often visited him here, and many of the people who are now regarded as «history makers» often visited Davenport in his island home. During the Civil War the prison here was the place of detention of many Confederate prisoners. When the Mississippi Valley began to change from a raw producing region to a section sending to the world the finished and polished product of the best in manufacturing methods, Rock Island was among the leading cities which were quick to welcome the railroad and the manufactory, and the first to use the improved means presented to extend the commerce to the city. Pop. (1920) 35,177.

**ROCK KANGAROO or WALLABY.** See KANGAROO.

**ROCK-MELON.** See MELONS.

**ROCK PTARMIGAN.** See PTARMIGAN.

**ROCK-RABBIT.** See HYRAX.

**ROCK RAPIDS,** Iowa, city, county-seat of Lyon County, on the Rock River, and on the Illinois Central, the Chicago, Rock Island and Pacific and the Chicago, Saint Paul, Minneapolis and Omaha railroads about 70 miles north of Sioux City and 33 miles southeast of Sioux Falls, S. D. It is in an agricultural and stock-raising region. It has considerable manufacturing interests connected chiefly with farm and dairy products. It owns and operates the electric light, water and heating plants valued at $150,000. It is the commercial centre for a large part of the county. Pop. 2,200.

**ROCK RIVER** rises in the State of Wisconsin, 50 miles west of Lake Michigan; it flows south-southwest, receives several tributaries, enters Illinois, and crossing the State in a southwesterly direction flows into the Mississippi a little below Rock Island. Its whole length is estimated at 330 miles, about 225 of which have been ascended by small steamers, though with some difficulty, owing to the various rapids. The region which it drains is one of great fertility. It is connected with the Illinois River by the Mississippi Mineral Canal.

**ROCK-ROSES.** See CISTUS.

**ROCK SALT.** See SALT.

**ROCK-SNAKE,** an African python. See PYTHON.

**ROCK-SOAP,** a hydrated silicate of aluminum, containing peroxide of iron and water. It is a variety of halloysite, is found only massive, is earthy, easily broken, black or nearly so, very soft, somewhat greasy to the touch and adheres strongly to the tongue. Rock-soap is used for crayons, and is also useful, by reason of its saponaceous properties, in the washing of cloths, etc.

**ROCK SPRINGS,** Wyo., in Sweetwater County, on Bitter Creek, and on the Union Pacific Railroad, about 250 miles west of Laramie, and 170 miles east of Great Salt Lake. It is on a plateau, in a mountainous region in which there are extensive coal fields. The principal industries are connected with the mining and shipping of coal. There are banks and newspapers. The educational institutions are a public high school, public and parish elementary schools and a high school library. Pop. (1920) 6,456.

**ROCK TEMPLES.** In many parts of western India, as at Ellora, Elephanta, Karli and Salsette Island, natural rocks have been cut into temples; as also into caves and forts. Out of India well-known instances of the same kind occur at Petra, in the Arabian Desert, at Abu-Simbed, in Egypt, and in China and Siam. Consult Ferguson, 'Rockcut Temples of India' (1889). See CAVE-DWELLERS.

**ROCK-TROUT,** a valuable fish (*Hexagrammus decagrammus*) of the coast of California and northward. It is one of the greenlings (q.v.), and is known northward as boregat and bodieron. It reaches a length of 18 inches, and is regarded as an excellent food-fish.

**ROCK-WORK.** See MASONRY.

**ROCK-WREN,** a grayish-brown migatory wren (*Salpinctes obsoletus*) of the Rocky Mountain region which haunts the mountain gulches and makes a big rough nest in some rift of rock, or on a ledge. It has a charming song, and is likely to come familiarly about the mountaineer's cabin.

**ROCKALL ISLET,** in the North Atlantic Ocean, 160 miles west of Saint Kilda, 260 miles north of Ireland and 290 miles west of the mainland of Scotland, is an isolated conical rock of stratified granite, 100 yards in circumference, rising 70 feet above the sea, from a sandbank about 50 miles long and 25 miles broad. The vicinity is a cod-fishing ground for Scotch and English fishermen. The first known landing was made in 1810, and the islet was the object of a scientific expedition in 1896.

**ROCKEFELLER, John Davison,** American capitalist: b. Richford, Tioga County, N. Y., 8 July 1839. After an education in the public schools of Cleveland, he there entered a mercantile establishment as clerk, and subsequently was made cashier and bookkeeper. In 1858 he became a member of the firm of Clark and Rockefeller, and in 1860 the concern entered the oil business as Andrews, Clark and Company. The firm, its style having been changed to William Rockefeller and Company, built the Standard Oil Works at Cleveland in 1865, and in 1867 the various interests with which John and his brother William were connected were consolidated into one corporation. In 1870 the Standard Oil Company was incorporated, with John D. Rockefeller as president; and a capitalization of $1,000,000. Thus at 31 he had already attained a commanding position in business, with ample resources. Then began that development and absorption which have been the wonder of the age and the subject of rare discussion, criticism and admiration. Gradually rivals in business were either taken into the Standard or driven out of the field. Within two years the Standard Oil Company's capital was $2,500,000, and in 1874 was $3,500,000. From that date the wealth of the company and of John D. Rockefeller grew by leaps and bounds and cannot be adequately figured. By 1881 it became necessary to better consolidate the enormous enterprises and the Standard Oil Company was made a trust under the guidance of the shrewdest lawyers of the country. It continued to make money so fast and to be so unpopular a monopoly that it was dissolved by the courts in 1892. By this time Mr. Rockefeller's wealth was variantly estimated as between $500,000,000 and $1,000,000,000. He was the world's only billionaire. About 1900 Mr. Rockefeller began to turn his great business over more and more to his partners, and to take an interest in establishing and supporting charitable and useful works. His chief gifts have been to the University of Chicago, which has received from him about $23,000,000; the General Education Board, $50,000,000; the Rockefeller Foundation, $100,325,000; Rockefeller Institute of Medical Research, $4,000,000. He has given to a vast number of educational institutions, and the total is estimated, 1918, as about $300,000,000. He presented also to Cleveland real estate and cash to the value of $600,000; to Vassar College a $100,000 building and 3,000 volumes on Greek art and literature; to Tarrytown, N. Y., $50,000 for a high-service water tower; to the American Baptist Missionary Union, $400,000; and to Barnard College, $1,375,000.

**ROCKEFELLER, John Davison, Jr.,** American capitalist, son of J. D. Rockefeller: b. Cleveland, Ohio, 29 Jan. 1874. In 1897 he was graduated at Brown University with the degree of A.B. Soon afterward he became associated with his father in business enterprises; was made a director of the Colorado Fuel and Iron Company, the Manhattan Railway Company, the Merchants Fire Assurance Corporation, etc. He is active in Sunday-school and philanthropic work; is chairman of the board of the Rockefeller Foundation; trustee of the Rockefeller Institute for Medical Research; director of the General Education Board, Bureau of Social Hygiene. Consult 'Report' of the Federal Industrial Relations Commission (Washington, D. C., 1915).

**ROCKEFELLER, William,** capitalist: b. Richford, N. Y., 31 May 1841; d. Tarrytown, N. Y., 24 June 1922. After schooling at Owego, N. Y., and Cleveland, Ohio, he became a bookkeeper and afterward a partner in a produce commission business. He became associated with his brother, John D. Rockefeller, when the latter became established in the oil business and in 1865 William Rockefeller took the management and was at the head of the business in New York and was president of the Standard Oil Company of New Jersey and also of New York, until the trust was dissolved in 1911. He was an official of a great number of corporations, among them the New York, New Haven and Hartford Railroad Company, being one of the 21 directors indicated in 1914.

**ROCKEFELLER, William Goodsell,** capitalist, son of William Rockefeller; b. 1870. After graduation from Yale, in 1892, he was made treasurer of the Standard Oil Company of New York, and has been elected director in the Brooklyn Union Gas Company, the Lincoln National Bank, the Columbia Bank and other financial institutions.

**ROCKEFELLER FOUNDATION.** In March 1910 Mr. John D. Rockefeller set on foot a scheme to distribute a large amount of his wealth, for the avowed purpose of uplifting humanity all over the world, by organizing his philanthropic work through the United States government. At his request Senator Gallinger introduced a bill in the Senate creating the «Rockefeller Foundation,» which, in the language of the bill, was «to promote the well-being and advance the civilization of the peoples of the United States and its territories and possessions, and of foreign lands, in the acquisition and dissemination of knowledge, in the prevention of suffering and in the promotion of any and all the elements of human progress.» The bill failed to pass the United States Senate, and the State of New York granted a charter to the Rockefeller Foundation in 1913. Its endowment is $101,324,576.78. The incorporators are John D. Rockefeller, John D. Rockefeller, Jr., Frederick T. Gates, Harry Pratt Judson, Simon Flexner, Starr J. Murphy, Jerome D. Greene, Wickliffe Rose and Charles O. Heydt. The officers are Chairman of the board of trustees, John D. Rockefeller, Jr.; president, George E. Vincent; secretary, Edwin R. Embree; treasurer, L. G. Myers; comptroller, Robert H. Kirk; assistant treasurer, L. M. Dashiell; members, Wallace Buttrick, Simon Flexner, Harry E. Fosdick, Frederick T. Gates, A. Burton Hepburn, Charles E. Hughes, Harry Pratt Judson, Starr J. Murphy, John D. Rockefeller, John D. Rockefeller, Jr., Wickliffe Rose, Julius Rosenwald, Martin A. Ryerson, Frederick Strauss, George E. Vincent. During the war the flood of gold poured out to relieve the suffering and the necessities of humanity covered pretty much the whole world. To the United War Work Fund went more than $5,000,000, after large appropriations had been made to the seven individual agencies composing the united service; an equal amount having gone to those previously. Large sums went for medical research, the war work of the Rockefeller Institute, for war research, including the work of Dr. Alexis Carrel, for hygiene and for demonstrations. Great sums were appropriated for relief in the small countries devastated — Belgium, $1,498,000; Armenia and Syria, $610,000; Serbia, $163,895. The American Red Cross received the immense contribution of $8,083,772. The Foundation spent $22,444,815 on war work from 1914 to 1919. Adverse criticism has been expressed at various times in regard to the educational activities of the Foundation, it being alleged that its aim is to further entrench capitalism and to promote class education in the United States. Its religious activities have also been under suspicion.

**ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH.** This institution was incorporated 14 June 1901, with Dr. William H. Welch, of Baltimore, president; Dr. T. Mitchell Prudden, of New York; Dr. Christian A. Hester (since died in 1910); Dr. Theobold Smith, of Boston; Dr. Hermann M. Briggs, of New York; Dr. Simon Flexner and Dr. L. Emmet Holt, of New York (secretary and treasurer), for a board of scientific directors. Mr. Rockefeller pledged $200,000 to the board to be drawn upon at their discretion during a period of 10 years, for preliminary work, his letter of gift expressing his desire «to accomplish the most for humanity and science.» Scholarships and fellowships were created and distributed to the existing laboratories throughout the country, to enlist the co-operation of various investigators, to aid some promising lines of research which could not previously be continued for lack of funds, and to discover who and where were the persons who desired to undertake research work and what were their qualifications. At the end of the first year it was decided to centralize the most important lines of work in the Institute's own laboratory under a competent head and with special equipment. Mr. Rockefeller gave $1,000,000 at the second annual meeting of the board in June 1902 for this object. The Schermerhorn property, fronting East River at East 66th and 67th streets, New York, was chosen for the site, and a plot comprising 26½ city lots, upon which the present building stands, was deeded to the Institute. Dr. Simon Flexner resigned his position as professor of pathology in the University of Pennsylvania to become director of the Institute and began his work 1 July 1903. The cornerstone of the building was laid 3 Dec. 1904, a building at the corner of Lexington avenue and 50th street being used temporarily.

The present organization provides for the following departments: Pathology, bacteriology, physiological and pathological chemistry, physiology, comparative zoology, pharmacology and experimental therapeutics.

The purpose of the Institute is research, not instruction; yet it exerts a considerable influence on medical education. Upon the basic sciences above mentioned the future discoveries on medical science must largely rest. The Institute endeavors to apply the latest discoveries in science to problems connected with the prevention and cure of disease.

The Institute has co-operated with the Health Department of New York in the study of conditions surrounding the production and distribution of the milk supply of the city, and the effects of milk upon the health of children in the tenements; also with the commission appointed by the city in 1904 to study the prevalence of the acute respiratory diseases, and with that appointed in 1905 to investigate cerebro-spinal meningitis. It has united with Harvard University in sending men to Manila to study certain phases of smallpox; and it has made grants each year to assist important investigations which were being carried on in various places.

The work done by the Institute is published in various scientific journals and collected in volumes of 'Reprints.' In February 1905 the Institute took charge of the publication of *The Journal of Experimental Medicine*.

Mr. Rockefeller gave an additional $3,820,000 when the hospital of the Institute was opened on 7 Oct. 1910. This made the income bearing endowment $6,420,000, and the total endowment, including grounds and buildings, $8,240,000. In the hospital the closest scientific study is given to obscure pathological conditions such as heart disease, pneumonia and infantile paralysis. The board of trustees of the Institute consists of John D. Rockefeller, Jr., Frederick T. Gates, William H. Welch, Starr J. Murphy and Simon Flexner.

**ROCKEFELLER PLAN.** See INDUSTRIAL PEACE, EXPERIMENTS IN.

**ROCKET,** the name of several plants. Rocket-salad, or properly *Roquette,* is a low-growing hardy annual (*Eruca sativa*) native to southern Europe. The young leaves are used by French and Italian cooks as a salad and pot-herb. They resemble radish in appearance, but horse-radish in flavor. Yellow rocket, upland or common winter cress (*Barbarga vulgaris*), also hails from southern Europe. It is a hardy biennial herb with yellow flowers for which it is grown in flower gardens. Its leaves are used for salads and pot-herbs. Sweet rocket, damask or dames violet (*Hesperis matronalis*), a tall, hardy perennial, is native to northern Asia and Europe. It has long been popular in old-fashioned flower gardens for its white or purplish flowers, which continue from June to August and are fragrant especially at night. The double forms are the best to grow.

**ROCKETS.** See PROJECTILES.

**ROCKFORD,** rŏk'fôrd, Ill., city, county-seat of Winnebago County, on the Rock River, and on the Chicago and Northwestern, the Chicago, Milwaukee and Saint Paul, Chicago, Burlington and Quincy and the Illinois Central railroads, 81 miles northwest of Chicago. It was settled in 1834, being the first settlement in the county, and was incorporated as a city in 1853. In 1890 it obtained a considerable increase of territory by annexation, and now has an area of ten and one-half square miles. It is built on both sides of the river, which is here crossed by three railroad and four highway bridges. A dam 800 feet long across the river secures excellent water power for manufacturing, and the city is one of the most important industrial centres of northern Illinois. The chief manufactures are agricultural implements and furniture; others are pumps, watches, silver-plated ware, leather goods, sewing machines, clothing, knitting wool, paper, flour and grape sugar. There are about 600 manufacturing establishments, with over 20,000 employees and an annual production of $25,000,000. The assessed valuation, which is one-third of the actual, was $25,102,470 in 1918; while the city debt was $477,100. The tax rate of $6.52 is equivalent to $2.17 on the actual valuation. There are numerous banks, trust companies and newspapers. Rockford is surrounded by a fertile agricultural region, and with its railroad facilities is an important shipping point for the products of this district. The city is well built with wide regular streets; among its notable public buildings are the Memorial Hall for Soldiers, the city hall, the courthouse, municipal tuberculosis sanitarium, three hospitals and the public library; the library contains over 80,000 volumes. The public school system is of the best, and includes a high school, organized in 1857; there is also a Roman Catholic parish school; and the city is the seat of Rockford College (for women) and of Brown's Rockford Business College. The government is vested in a mayor and council, elected biennially; the council has the power of appointing the city officers. There is an excellent water supply from five artesian wells, and the waterworks are owned and operated by the municipality. Pop. 65,657. Consult Church, C. A., 'History of Rockford and Winnebago County, Illinois' (1900).

**ROCKFORD COLLEGE**, a college for women, located at Rockford, Ill. It was founded in 1849 as a seminary and received its college charter in 1892. It has a collegiate department, department of music and preparatory department; the collegiate work is in two courses, classical and general scientific, for the completion of which the degrees of A.B. and B.S. are conferred. In 1923 the ground and buildings and productive funds had a value of $1,250,000 and the annual income to $225,000. In 1923 the students numbered 500 and the instructors 43.

**ROCKHAMPTON**, rŏk-hămp'ton, Australia, capital of the County of Livingstone, Queensland, on the Fitzroy River, about 325 miles northwest of Brisbane, almost on the Tropic of Capricorn. It is enclosed by hills and is the gateway to rich pasture lands and the adjacent Mount Morgan mineral fields. There are many fine buildings and a bridge 1,160 feet in length. It has considerable river traffic with the ports of Alma and Broadmount at the mouth of the river, 35 miles distant. The Queensland Central Railway has its terminus here. Pop. 20,915. North Rockhampton is a suburb and separate municipality with a population exceeding 3,000.

**ROCKHILL, William Woodville**, American diplomatist: b. Philadelphia, 1 April 1854; d. 1915. He was educated at the Lycée Bonaparte and the Collège de France, Paris, and was graduated from the military school of Saint Cyr in 1871. He served with a French regiment in Algeria but returned to the United States in 1876. In 1881 he returned to France and resumed his Oriental studies begun during his college course, and in 1884 entered the diplomatic service as second secretary of legation at Peking, China. He was *chargé d'affaires* at Seoul, Korea, 1887–88; visited China, Mongolia and Tibet during 1888–92 on exploring tours; was appointed chief clerk of the State Department in 1893; was made third Assistant Secretary of State a year later, and first assistant in 1896. He was Minister to Greece, Rumania and Servia, 1897–99, and the following year went as United States commissioner to China, where in 1901, under appointment as special ambassador, he signed the final peace negotiations. In October 1901 he resumed his duties as director of the Bureau of American Republics, to which he was appointed in 1890. He was Minister to China in 1905, Ambassador to Russia in 1909 and Ambassador to Turkey from 1911 to 1913. In 1915 he was sent on a mission to China, but died on the way at Honolulu. He has published 'Udanavarga, the Northern Buddhist' (1883); 'A Life of Buddha and the Early History of His Church' (1884); 'Land of the Lamas' (1891); 'Diary of a Journey in Mongolia and Thibet' (1893); 'Treaties and Conventions with China and Korea' (1904).

**ROCKING STONES**, boulders that are very insecurely balanced on their foundation. They are also known as perched or balanced bowlders. Sometimes they result from the weathering away of the surrounding rock, leaving the bowlder as a residual. More often they are carried in glacial ice and left in unstable positions as the ice melts.

**ROCKINGHAM**, rŏk'ĭng-ạm, **Charles Watson-Wentworth**, Marquis of, English statesman: b. 13 May 1730; d. 1 July 1782. He was educated at Westminster School and Saint John's College, Cambridge, and in 1750 was created an Irish peer under the titles of Baron and Earl of Malton, later in the same year becoming also an English peer and Marquis of Rockingham by succession. He took his seat in the House of Lords in the following year and continued in practice with his Whig sympathies which he had inherited from his father. He took little part in politics, being a hesitating speaker and of mediocre talent, until 1765 when on the refusal of Pitt to take office, he became Prime Minister. His large wealth and powerful family position contributed to his elevation, and he had the invaluable assistance of his brilliant secretary, Edmund Burke. He took a friendly attitude toward the American colonies and favored the repeal of the Stamp Act, though he affirmed the right of Parliament to tax the colonies. He gave offense to the king for his support of the repeal principle and for refusal of allowances of the king's brothers and was superseded by Pitt, who returned to form a new ministry. His tenure lasted barely a year and his Parliamentary career was inconspicuous until March 1782 when, upon the fall of North's administration, he was called upon to form a coalition ministry in which he held the treasury. The chief events of his second term were the concession of legislative independence to Ireland and the forcing the king to treat for peace with the United States on the basis of their independence. In accomplishing these ends credit is not given to Rockingham for exceptional force and brilliancy, but rather for quiet tact and the adoption of a policy of opportunism. Consult Albemarle, 'Memoirs of Rockingham' (1852–53); Walpole, 'Memoirs of George III' (1894).

**ROCKINGHAM**, Vt., village and township in Windham County. The village is on the Rutland Railroad, 75 miles south of Montpelier. The township contains in addition to the village of the same name the villages of Bellows Falls, Saxton's River, Cambridgeport, and Bartonsville. The district is chiefly agricultural, but there are paper mills and machine shops. The village is the seat of an academy. Pop. township 6,207.

**ROCKLAND**, Me., city and county-seat of Knox County; set off from Thomaston in 1848 and incorporated a city in 1854. On a harbor which is an easterly extension of Penobscot Bay at its mouth; is very commodious and easily accessible; is protected by a breakwater costing $500,000 and two lighthouses. Rockland is connected with Maine Central Railroad system; 86 miles by rail from Portland; has steamboat connection with Boston, Bangor, Portland, etc. It has a complete electric railway system with 21 miles of track extending northward to Rockport and Camden, and westward to Thomaston and Warren and other electric railways. The region thus connected accommodates many summer tourists. Shipbuilding is an important industry. The *Red Jacket,* a clipper ship built at Rockland in 1853, is said to have made the passage across the Atlantic Ocean in a shorter time than it was ever made by any other sailing vessel. There are considerable deposits of lime and large lime and cement works have been established. The granite business is important. Two of the largest granite companies of the country have quarries in the vicinity, on the islands and on the mainland. These companies have handled some of the largest stone that have ever been wrought. The United States custom house in Saint Louis, the post offices in New York and Cincinnati, and many of the largest and handsomest buildings in the country have been built of Rockland granite. Steam and gasoline engines and blacksmiths' and granite workers' tools are manufactured. Fishing is carried on to some extent. Clams and sardines are canned, and more than 2,000,000 pounds of lobsters are shipped annually by rail. The public buildings are the United States custom house and post-office building, which is a handsome granite structure and cost about $150,000, and the county courthouse and jail, costing over $100,000. There is a fine soldiers' monument, a public library, banking facilities and newspapers. There are many handsome residences with fine grounds. Pop. 8,174.

**ROCKLAND,** Mass., town in Plymouth County, on the New York, New Haven and Hartford Railway, about 17 miles south by east of Boston. Until its incorporation as a separate town in 1874 it was a part of the town of Abington of the old Plymouth Colony. The town is pleasantly situated and its proximity to Boston and the convenience of transportation give it an excellent trade and have made it a popular suburb of that city. Rockland is a manufacturing place, with about 100 factories, distributing about $750,000 annually in wages. The industry first in importance was the manufacture of boots and shoes. Tacks are also extensively manufactured, and other factories produce heels and shoe-findings, box board, shoe-boxes and soaps. Rockland has well-built factory and public buildings, churches, schools and attractive homes. It has two banks, a public library and weekly newspapers. Pop. (1920) 7,544.

**ROCKLAND LAKE,** N. Y., a village of Rockland County, on the West Shore Railway and on the Hudson River, four miles north of Nyack and 30 miles north of New York. It has only a small permanent population but is a popular summer resort. Near here is Rockland Lake, a large sheet of clear, fresh water, from which 300,000 tons of ice are taken annually for use in New York.

**ROCKLING,** a European fish of the cod family and of the genus *Motella,* also classified as the *gaidropsaurus,* three species of which are regarded as valuable in British markets. They are of small size, with small scales, long body and one anal and two dorsal fins. Called also gade, whistlefish, sea-loach and eelpout.

**ROCKPORT,** rok'port, Ind., city, county-seat of Spencer County, on the Ohio River on a branch of the Southern Railway about 32 miles east of Evansville. It has steamer connections with all the river ports. It is on a bluff about 100 feet above high water. It is in an agricultural region in which grain and tobacco are the chief productions. The principal industrial establishments are flour and grist mills, foundry, machine shops, tobacco stemmeries, brick works, silo works, basket factories, creamery, wagon and carriage works and furniture factories. It has a library founded in 1855. Pop. (1920) 2,581.

**ROCKPORT,** Mass., town in Essex County, on the Atlantic Ocean and on the Boston and Maine Railroad, about 30 miles northeast of Boston. It is on an island, the same on which Gloucester (q.v.) is located, and includes Cape Ann, the most easterly point in Massachusetts. The town embraces several villages. Electric lines connect Rockport and Gloucester and many points on the island. It was settled in 1690 by Richard Tarr and was known at first by the name «Sandy Bay.» It is a famous summer resort; near Pigeon Cove, one of the villages, are a number of summer cottages. Part of the land is fertile and is used mainly for market gardening. Some of the places of interest in the vicinity are Dogtown Commons, where in the last of the 18th century a hundred families exiled themselves and lived in loneliness and poverty on those bowlder strewn hills. Their numerous dogs gave the place its name. Other places of interest are Doctor's Run, The Headlands and the Straitsmouth Life Saving Station at Gap Cove. In the northeastern part of the town are extensive granite quarries. The chief manufacturing establishment is an isinglass factory which employs about 1,000 persons. There are one national and one savings bank. There are 12 churches, and the educational institutions are a high school, grammar and primary schools and a public library, opened in 1871. Pop. about 4,400, of whom 3,878 are in the village.

**ROCKPORT,** Tex., town, county-seat of Aransas County, on the Aransas Bay, an inlet of the Gulf of Mexico, and on the San Antonio and Aransas Pass Railroad, about 180 miles southwest of Galveston and 150 miles south by east of San Antonio. It was settled in 1865 by Doughty and Mathis; was incorporated in 1865 and chartered as a city in 1871. It has steamer connections with all of the Gulf ports. It is on the peninsula, Live Oak Point and is a popular summer resort. It has fishing interests, especially oysters, and small game is plentiful in the vicinity. Shipments are made of livestock and fruit. There are five churches, a high school, elementary schools and one national bank. The government is vested in a mayor and a board of aldermen, eight in number, who are elected biennially. Pop. (1920) 1,545.

**ROCKS.** Regarded as a whole, the earth, so far as we can examine it first hand and thus know it intimately, consists of three envelopes: (1) an outer gaseous envelope called the atmosphere; (2) a middle aqueous envelope called the hydrosphere; (3) an inner solid envelope called the lithosphere. These envelopes, considered together, including the lithosphere to a depth of some 10 miles below the sea-level, have been shown to consist quantitatively of the following elementary substances:

| | | | |
|---|---|---|---|
| Oxygen | 47.07 | Potassium | 2.45 |
| Silicon | 28.06 | Sodium | 2.43 |
| Aluminum | 7.90 | Magnesium | 2.40 |
| Iron | 4.43 | | |
| Calcium | 3.44 | Total | 98.18 |

All the remaining elements together make up less than 2 per cent of the earth.

The above-named elements rarely occur in the uncombined state in the lithosphere, but are usually united chemically in different proportions to form those more or less definite chemical compounds called minerals (for example, quartz, $SiO_2$; calcite, $CaO.CO_2$; olivine $(MgFe)_2SiO_4$; and minerals in turn are aggregated in various ways to form rocks. A rock may be defined as any accumulation or aggregation of one or more mineral species or substances, which constitutes a considerable component of the lithosphere; for example, granite, sandstone, limestone, clay, gravel, salt-beds. Although the crust of the earth or lithosphere has been shown to contain many hundreds of species of minerals, nevertheless the great bulk of it is composed of comparatively few species, and these have been termed the rock-forming minerals, in contradistinction to the great multitude of mineral species found more particularly in veins, and which, though of great importance, economically, and of primary interest, scientifically, are insignificant in amount when compared with the great mass of the more common minerals which go to make up a large portion of the earth. Thus gold, silver, platinum, the sulphide ores and the minerals containing such rare substances as thorium, uranium or radium, are negligible in quantity when compared with the mass of minerals composing the lithosphere.

The science of rocks, in its broadest scope, which considers them in all their relations, is called petrology or lithology, while the systematic and descriptive science of rocks, leading more particularly to their nomenclature, is called petrography. This distinction is implied in the etymology of the words. The latter term is used commonly in connection with the microscopic study of the igneous rocks.

Those minerals which are of especial importance as rock-formers can be grouped as follows:

### GROUP I.

**Quartz.**— This group, for present purposes, may be limited to a single species, quartz, which is one of the most abundant of minerals, and is remarkable otherwise for its rather superior hardness and lack of cleavage. It is the most indestructible of all the common rock-making minerals. It has strong crystallizing powers and, where allowed to grow intact, forms those beautiful hexagonal crystals with which all are familiar. Chemically it is an oxide of silicon, $SiO_2$, that most abundant of all acid radicals, which, when combined with the bases alumina, lime, iron, magnesia and the alkalies, soda and potash, in different ways, forms that most important of all classes of mineral substances, the silicates.

### GROUP II.

**Feldspars.**— These are the most abundant of all rock-formers. They comprise a rather complex group of silicates, where alumina, the alkalies, potash and soda, and the alkaline, earth, lime, are the bases. On a chemical and crystallographic basis they fall naturally into two series, the orthoclase and the plagioclase. Orthoclase is the type-species of the series. It is a silicate of potash and alumina having the chemical composition $KAlSi_3O_8$, and is otherwise known as potash feldspar. It belongs to the monoclinic system of crystallization. A part of the potash of orthoclase may be replaced by soda. In fact most of the analyses of the mineral show only 1 per cent or more of the substance. This replacement of potash by soda can take place until these two constituents are present in nearly equal proportions without altering the monoclinic character of the species. Such an orthoclase is called soda-orthoclase.

Microcline, like soda-orthoclase, contains both potash and soda $(K,Na)AlSi_3O_8$. It is, however, triclinic, but only slightly so. As it possesses a notable amount of potash, it may be classified with soda-orthoclase as representing the transition varieties of feldspar, lying between the monoclinic, potash, orthoclase series and the triclinic, soda-lime, plagioclase series.

The more typical plagioclases are represented by albite, oligoclase, andesine, labradorite, bytownite and anorthite, which together constitute the albite-anorthite series. The theory of their constitution was propounded by Tschermark in 1864. He showed that the series can best be explained as a mixture of two extreme molecules, the one a pure soda-alumina silicate molecule, and the other a lime-alumina silicate molecule, found in anorthite. The intermediate varieties can be considered as varying mixtures of these two molecules.

The feldspars are not only of primary importance as rock-formers, but the classification of rocks as at present accepted (more particularly the igneous varieties) depends largely upon the kind of feldspar which they contain.

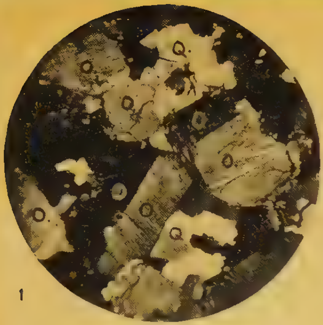
The feldspars can be grouped in tabular form thus:

| | |
|---|---|
| (a) Monoclinic | |
| Orthoclase (sanidine) | $KAlSi_3O_8$ |
| Soda-orthoclase | $(Na,K)AlSi_3O_8$ |
| (b) Triclinic | |
| Microcline | $(K,Na)AlSi_3O_8$ |
| Soda-microcline | $(Na,K)AlSi_3O_8$ |
| Albite | $NaAlSi_3O_8$ |
| Oligoclase | Mixture of albite and anrothite |
| Andesine | |
| Labradorite | |
| Bytownite | |
| Anorthite | $CaAl_2Si_2O_8$ |

### GROUP III.

**Feldspathoids.**— The minerals of this group are called feldspathoids or feldspar-like minerals, more particularly because of their chemical resemblance to the feldspars. There are but two species which need be considered here: leucite, which has a chemical composition expressed by the formula $KAl(SiO_3)_2$; and nephelite, having the composition $K_2Na_6Al_8Si_9O_{34}$. Chemically leucite resembles

# ROCKS



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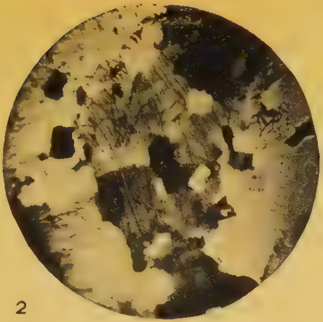

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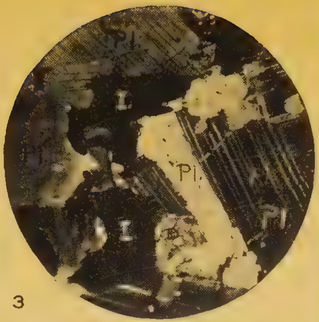

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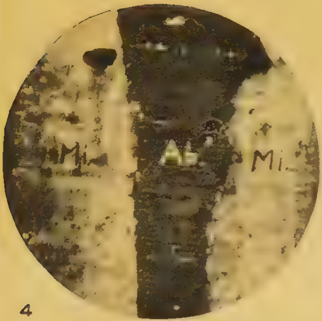

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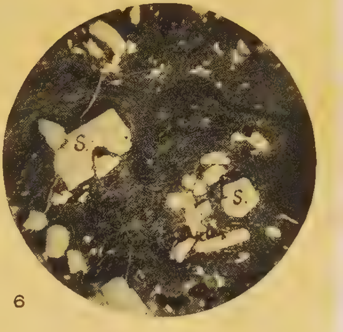

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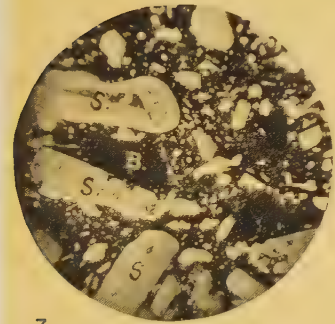

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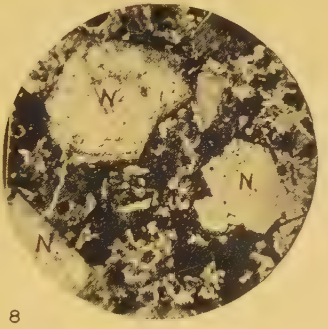

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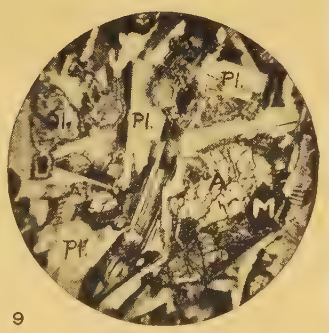

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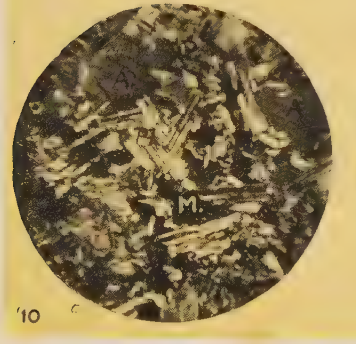

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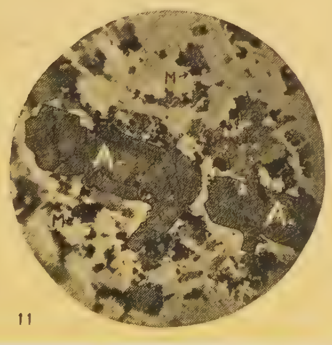

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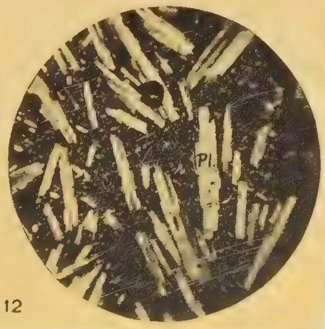

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orthoclase feldspar. In addition to being chemically like orthoclase, leucite, like its counterpart, alters to kaolin. But more interesting still is the fact that on decomposition it has been known to furnish orthoclase or orthoclase and muscovite.

Nephelite, as its chemical composition indicates, is analogous to the plagioclase feldspars. It is hexagonal in character. The decomposition of nephelite, like that of the plagioclases, usually results in the formation of some one of the zeolites, or more rarely it forms kaolin.

The feldsparthoids are lower in silica than their corresponding feldspars, and it is believed that, where they are present, true feldspars would have formed, except for this deficiency in silica. They hold an important place in the classification of rocks.

### GROUP IV.

**Mica.**— Two species here are of widespread occurrence; one is muscovite, the white, silvery, potash variety, having a chemical composition corresponding to $H_2KAl_3(SiO_4)_3$. Chemically it is closely allied to orthoclase, and frequently results as an alteration product of that mineral. The second species, biotite, is dark-colored, owing to comparatively high percentages of iron. It also contains varying amounts of magnesia, and might thus be properly classed with the following group of minerals. It has the chemical composition $(HK)_2(MgFe)_2(AlFe)_2(SiO_4)_3$.

### GROUP V.

**The Ferromagnesian Minerals.**— The minerals of this group take their name from the fact that they contain iron and magnesia as two of their prominent constituents. In addition they may contain lime and alumina in considerable amounts, also some alkali. The more important members of the group are included under the amphiboles and the pyroxenes, two species having numerous varieties. They form two parallel series which are both chemically and crystallographically analogous. Their relationship can best be shown by the following table:

| | |
|---|---|
| Amphibole | |
| (a) Orthorhombic | |
| Anthophyllite | $MgSiO_3$ |
| (b) Monoclinic | |
| Tremolite | $CaMg_3(SiO_3)_4$ |
| Actinolite | $Ca(MgFe)_3(SiO_3)_4$ |
| Hornblende | $Ca(MgFe)_3(SiO_3)_4$<br>$CaMg_2Al_2(SiO_4)_3$ |
| Glaucophane | $NaAl(SiO_3)_2,MgSiO_3$ |
| (c) Triclinic | |
| Ænigmatite | $Na_4Fe_9AlFe(Si,Ti)_{12}O_{38}$ |

| | |
|---|---|
| Pyroxene | |
| (a) Orthorhombic | |
| Enstatite | $MgSiO_3$ |
| Hypersthene | $(Mg,Fe)SiO_3$ |
| (b) Monoclinic | |
| Diopside | $MgCa(SiO_3)_2$ |
| Augite | $CaMg(SiO_3)_2$<br>$MgAl_2SiO_6$ |
| Acmite | $NaFe(SiO_3)_2$ |
| (c) Triclinic | |
| Rhodonite | $MnSiO_3$ |

The really important rock-forming amphiboles and pyroxenes are to be found among the orthorhombic and monoclinic varieties. And it is necessary to distinguish here between those which are aluminous and those which are non-aluminous, for the special reason that the former on alteration produce chlorite, while the latter produce serpentine.

One other important rock-former must be mentioned as belonging to this group — olivine, so called on account of its usual olive-green color. It has the chemical composition $(Mg,Fe)_2SiO_4$, is orthorhombic in crystallization, and readily decomposes to serpentine.

### GROUP VI.

**Ores.**— Minerals of this group that constitutes important rock-formers usually have iron as their principal constituent, and frequently constitute ores of that substance. Included here are:

| | |
|---|---|
| Magnetite | $FeFe_2O_4$ |
| Pyrite | $FeS_2$ |
| Hematite | $Fe_2O_3$ |
| Ilmentite | $FeTiO_3$ |
| Chromite | $FeCrO_4$ |

Thus far the mineral species enumerated are mostly found as the essential constituents of that class of rocks hereafter to be described as igneous.

### GROUP VII.

**Accessory Minerals.**— Those minerals which are usually of subordinate importance, and which are, therefore, more in the nature of accessory than notable rock-constituents, are included here:

| | | |
|---|---|---|
| Cassiterite | | $SnO_2$ |
| Rutile | | $TiO_2$ |
| Titanite | | $CaTiSiO_5$ |
| Apatite | | $Ca_4(CaF)\ (PO_4)_3$ |
| Monazite | | $(Ce,La,Di)\ PO_4$ |
| Corundum | | $Al_2O_3$ |
| Spinel | | $MgAl_2O_4$ |
| Garnet | Almandite | $Fe_3Al_2(SiO_4)_3$ |
| | Grossular | $Ca_3Al_2(SiO_4)_3$ |
| Staurolite | | $Fe(AlO)_4(AlOH)\ (SiO_4)_3$ |
| Chiastolite | | $Al(AlO)\ SiO_4$ |
| Kyanite | | $(AlO)_2SiO_3$ |
| Fibrolite | | $Al_2SiO_5$ |
| Cordierite | | $(Mg,Fe)_4Al_4Si_5O_{18}$ |
| Tourmaline | | $(Na_6Mg_3Al_2)_3(AlFe)_6(BOH)_4Si_8O_{38}$ |
| Topaz | | $(AlF)_2SiO_4$ |
| Fluorite | | $CaF_2$ |
| Zircon | | $ZrSiO_4$ |
| Allanite | | $(CaFe)_2(AlCaFe)_2AlOH(SiO_4)_3$ |
| Zoisite | | $Ca_2Al_2(AlOH)(SiO_4)_3$ |

Some of the above minerals occasionally come to be of considerable importance, or may even constitute the bulk of the rock-mass. As a rule, however, they are of minor consideration and frequently even negligible.

### GROUP VIII.

**Secondary Minerals.**— Minerals of this class have originated as the result of the decomposition or alteration of some previously existing primary or original mineral. The most noteworthy are:

| | |
|---|---|
| Kaolin | $H_4Al_2Si_2O_9$ |
| Serpentine | $H_4Mg_3Si_2O_9$ |
| Talc | $H_2Mg_3(SiO_3)_4$ |
| Chlorite | $H_8(Mg_3,Fe)_5Al_2Si_3O_{18}$ |
| Epidote | $Ca_2Al_2(AlOH)\ (SiO_4)_3$<br>$Ca_2Fe_2(FeOH)\ (SiO_4)_3$ |

Kaolin results from the decomposition of orthoclase and other feldspars by the loss of some of the silica and alkalies, and by the addition of water (hydration). Serpentine results from the alteration of olivine and the non-aluminous hornblendes and pyroxenes by the loss of some of the magnesia and by an addition of water. Talc is formed by the hydration and partial decomposition of several of the lime-magnesia or non-aluminous ferromagnesian minerals, namely, tremolite, pyroxene (chiefly enstatite), phlogopite mica. Chlorite results most frequently from the alteration of the aluminous hornblendes and pyroxenes. Epidote also results from the alteration of the aluminous varieties of hornblende and pyroxene, especially those having some lime in their composition.

### GROUP IX.

**Precipitations from Aqueous Solutions.**— The following minerals occasionally form important bodies of rock. They are usually deposited from solution in water:

| | |
|---|---|
| Salt | $NaCl$ |
| Gypsum | $CaSo_4,2H_2O$ |
| Aragonite or Calcite | $CaCO_3$ |
| Hydrous Silica<br>(Geyserite or Silicious Sinter) | $SiO_2,nH_2O$ |

**Origin of Rocks.**— Two alternative hypotheses are at present recognized as possible explanations of the origin of the earth: (1) the old so-called nebular hypothesis, propounded by Kant and Swedenborg and later elaborated by Laplace and others; (2) the newly proposed accretion theory or planetesimal hypothesis propounded by Prof. Thomas C. Chamberlin of the University of Chicago. The first of these supposes that the earth was originally in a gaseous condition, from which, under its own gravity and by a radiation of its heat, it passed into a fluid state and thence to a solid form. The «original crust» of the earth (lithosphere) formed at the surface as the result of a cooling of the molten materials of the globe. Furthermore, the earth may have solidified from the centre outward as the result of pressure. Others suppose that the original crust was not only added to from below by the crystallization of molten material, but also increased in thickness from above by chemical precipitations from the intensely heated hydrosphere. The accretion theory, on the other hand, supposes that the earth as a whole never was in a gaseous or even fluid condition, but was built up by the infalling of cold, solid particles of matter called planetesimals; that the present internal heat is the result of pressure due to gravity. Adherents of both these hypotheses agree, however, that the oldest known rocks, the original or primitive rocks from which all others have been derived, are of igneous origin, that is, were once in a molten condition, from which they cooled to the solid state, and in so doing formed more or less thoroughly crystalline aggregates of different kinds of minerals.

In discussing the origin and descent of rocks we must, therefore, start with the more common igneous varieties, and show how they have furnished materials for the others.

Rocks may be classified as (1) igneous, (2) sedimentary and (3) metamorphic.

### IGNEOUS ROCKS.

(Definitions depending upon external form and mode of occurrence.) Igneous rocks comprise all those portions of the lithosphere which are or were in an intensely heated and more or less fluid condition and which have subsequently solidified by cooling into massive, more or less crystalline bodies of varying sizes and shapes. They occur as intrusions into or replacements of some previously existing rocks of the lithosphere, either sedimentary, metamorphic or igneous. Where a huge mass of molten material slowly melts its way from some deep-seated portion of the earth up into the overlying rocks by dissolving them and incorporating them in its own mass, and subsequently cools there, slowly, without ever reaching the surface, forming a great irregular body of coarsely crystalline matter frequently scores of miles in extent, we have what is termed a batholith. In its molten condition it would be termed a magma and the reservoir in which it was contained would be called a magma basin. It might have extending from it (usually upward) irregular, more or less elongated, armlike processes called apophyses. Should cracks or fissures form, they would be instantly filled by the inrush of fluid substance, which would solidify with comparative rapidity to form dikes. In stratified rocks dikes usually cut at some angle across the strata. Where the molten material intrudes itself between the strata parallel to the bedding planes in broad sheets, it is called an intrusion-sheet or sill. Where the overlying strata become lifted and arched upward into a huge dome without breaking above and letting the fluid rock escape, the solidified lenticular mass constitutes a laccolith or laccolite. Where the molten rock actually escapes to the surface by means of a fissure or other conduit, and flows out over it in a broad sheet, it is termed a flow, lava-flow, or extrusion-sheet. The interval of time elapsing between the outbreak of the magma from its reservoir and its subsequent cooling to the solid state is termed the effusive period. If the conduit is rudely cylindrical the lava accumulates about the vent, forming a lava or volcanic cone. Subsequent erosion may entirely remove the cone and expose the cold lava in the conduit, to which the term volcanic neck is applied. In fact it is only through the exposure of these deep-seated masses of cooled igneous material by erosion that we are enabled to study them. Over the more ancient land areas many miles of rock, vertically measured, have been removed, laying bare the underlying rocks to a corresponding depth.

**The Modern Conception of Rock Magmas.**— The popularly accepted idea of lava is that it is rock which has been fused by great heat. In fact the older conception of scientific men was that magmas consisted of fused rock-masses. Recent opinion, however, based on the revelations of the microscope and experiments in the synthesis of minerals and rocks, tends to regard them as solutions of one mineral substance in another or of several mineral substances mutually in each other. One of the chief reasons for thinking them such can be stated as follows: If magmas are fusions then the individual mineral constituents potentially present in them should crystallize out according to their fusibilities, beginning with the least fusible, but they do not. On the other hand, as the magma slowly cools, the first individual mineral species makes its appearance when the point of saturation for that particular species is reached, and the others follow in the order of their solubilities. For example, in granite (which consists of quartz, feldspar and mica or hornblende, with some accessory constituent, such as apatite or zircon, and, it may be, also a small amount of one or more of the ores), the order of crystallization is: (1) the ores with apatite and zircon; (2) mica or hornblende; (3) feldspar; (4) quartz. Quartz is the least fusible, and should appear first under the fusion theory. As a matter of fact it appears last. In short, all of the materials appear in the reverse order of what we would expect if they are true fusions. But they do appear in the order of their solubilities. Pressure, however, exerts an important influence upon the solvency of a substance, and as this is variable the order of appearance is not absolutely fixed. Moreover, heat, the most important factor involved, is very variable, and still farther modifies the problem.

**The Splitting or Cleavage of Magmas (Spaltung, Magmatic Segregation, Magmatic Differentiation).**— When a magma cools, the first minerals to appear are the ores (with apatite, titanite, zircon, etc.); following these, the basic ferromagnesian constituents; then the more basic plagioclase feldspars, followed or overlapped by the orthoclase varieties; and last of all, quartz, if more than enough exists for the formation of the silicates. Obeying the principle of diffusion, the first minerals to form — the more basic ones — tend to accumulate on the cooling walls, that is, at the periphery of the magma-basin; and the other minerals arrange themselves rudely in concentric zones, each zone toward centre being successively more acid, until at the centre the magma becomes comparatively acid and may, after solidification, consist largely of such minerals as orthoclase and quartz. This arrangement of the minerals by diffusion before crystallization results in the rude separation of an originally uniform magma into several magmas of different chemical compositions, which, on cooling, furnish rocks of different mineralogical compositions. The process is termed the cleavage of magmas.

Definitions depending upon internal characteristics will next be considered.

**Texture.**— The fluid magmas of igneous rocks may be compared to molten glass. If the cooling period be long the individual minerals form comparatively large crystals. If it be short the crystals are correspondingly small. If it chills so suddenly that the molecules of the different mineral compounds do not have time to unite to form crystals, but are caught just as they existed originally in the fluid magma, the result is a volcanic glass. Rocks in which the crystals are five millimeters or more in diameter may be called coarse-grained; rocks in which the crystals range in size from one to five millimeters, medium-grained; and those in which they are one millimeter or less in diameter, fine-grained. Rocks in which all of the original magma has individualized or crystallized, to form minerals of some sort, and in which there is no unindividualized material remaining behind in the form of glass, are called holocrystalline. All rocks in which the crystals are large enough to be seen with the unaided eye are termed phanerocrystalline, or phaneric. Those rocks in which the crystals are too small to be distinguished megascopically are called aphanitic. Many aphanitic rocks, however, under the microscope are seen to be holocrystalline and to consist of small crystals of minerals which can be specifically identified with the aid of that instrument. For these rocks the term microcrystalline has been proposed. But the crystals, though recognizable, may be too small to be specifically identified even with the microscope. Such rocks are called microcryptocrystalline. Volcanic glasses show only embryonic crystals imbedded in textureless glass. Such rocks are said to be vitreous or glassy.

If during the entire period of solidification the conditions of cooling remained the same and the entire process of cooling of a deep-seated magma was slowly and quietly accomplished in the magma-basin, unattended by any effusive period, the rock would be coarse (to fine), evenly-granular. In rocks cooling under these circumstances the growing crystals have usually interfered with each other in such a way as mutually to destroy their crystal boundaries, forming irregular interlocking grains, with no one diameter much greater than the others. In other words, the grains are irregularly rounded. A texture of this sort is characteristic of the granites, and is called the granitic or granitoid texture. The term allotrimorphic, referring to the fact that the crystals do not possess their own boundaries, is applied to the same texture, and a still newer term, xenomorphic, has recently been proposed. Where the majority of the crystals do retain their crystal boundaries, the resulting texture is called idiomorphic or automorphic. If the crystal boundaries are only faintly or imperfectly discernible, the structure is said to be hypidiomorphic.

The period of solidification within the earth may be interrupted by an effusive period; in which case those crystals which had begun to form, and may have reached considerable size are carried by the eruption into other surroundings, where the cooling process may be much accelerated. A second generation of smaller crystals would then form about the large well-formed ones, imbedding them in a fine-grained ground-mass, producing what is termed porphyritic texture. Two or more generations of crystals may thus be recognized. The well-defined crystals of the first generation are called phenocrysts. The term felsite is applied to the fine-grained ground-mass of the acid rocks.

The crystals of some one mineral species in a rock may have one diameter much larger than the others. The crystals then appear distinctly lath-shaped in thin section under the microscope. This form of crystallization is especially common with the plagioclase feldspars. These laths of plagioclase are enclosed by crystals of another species. This texture is common, and in the scheme of classification of igneous rocks at present accepted is called into rather prominent requisition. It is known as the ophitic texture.

Flow-structure is exhibited by the parallel arrangement or orientation of minerals in lines which indicate the direction in which the fluid rock had been moving before solidification took place, or while it was in a viscous state.

**Classification of Igneous Rocks.**— The classification of igneous rocks as at present widely accepted is based upon three things: (1) chemical composition; (2) mineralogical composition; (3) texture. (The proposed 'Quantitative Classification of Igneous Rocks,' published jointly by Cross, Iddings, Pirsson and

Washington, Chicago 1903, is the most elaborate attempt at a thoroughly scientific classification of the igneous rocks yet proposed. It has not, however, as yet received general acceptance).

*Chemical Composition.*— The chemical composition of igneous rocks is primarily expressed in terms of silica percentage. Rocks which contain from 60 to 80 per cent of silica are called acid. Most of these rocks contain free quartz; those which range from 40 to 60 per cent in silica are called basic and rarely possess free quartz in any considerable amount; while those which fall below 40 per cent are termed very basic, and practically never contain original free quartz. Generally speaking, as the silica percentage declines the percentage of the bases (lime, iron, magnesia) increases. This change in chemical composition from acid to very basic is indicated by change in color, the acid rocks being light ashy gray, while the very basic are dark.

*Mineralogical Composition.*— Quartz is more or less abundant in rocks of the acid division, but soon disappears in passing toward the basic end of the series. Orthoclase is the dominant feldspar among the acid rocks, but even here the plagioclases are more or less common. Among the basic rocks the plagioclases prevail, and in a general way change from the albite to the anorthite variety as the more basic rocks are approached, but fail entirely in most rocks of the very basic division.

The ferromagnesian minerals are subordinate, almost negligible, in the very acid rocks. They become dominant in the basic and constitute the bulk of the very basic rocks.

The ores, chiefly magnetite, chromite and ilmenite, are found more or less sparsely disseminated through all three divisions, but they become notable constituents among the basic and very basic rocks and may even segregate to form important bodies of ore.

*Texture.*— As already explained, magmas which solidify deep within the lithosphere usually form coarse (to fine) evenly-granular rock-masses, having the granitoid texture, although they may be more or less porphyritic or idiomorphic in character. These deep-seated rocks are called plutonic. Where eruption takes place those rocks which solidify somewhere between the magma-basin and the surface (as intrusion-sheets, dikes, laccolites, etc.) are called intrusive, while those which cool subaerially (or it may be beneath bodies of water) are called effusive or extrusive. While neither the plutonic, intrusive nor extrusive members are limited to any one kind of texture, it is true that the plutonic rocks are more frequently granitoid, and the intrusive and extrusive members even-fine-grained, felsitic, asphanitic or porphyritic in texture, while the textureless volcanic glasses are nearly always extrusive.

**Rock-families: I. Acid Division; Granites.** — The granites are plutonic rocks occurring frequently as huge irregular masses which have slowly melted their way up from some deep-seated region into the more ancient and then deeply-buried portions of the lithosphere; or they may occur as apophyses or dikes given off from some parent mass. Mineralogically they consist of quartz, dominant feldspar of the orthoclase variety (with subordinate amounts of soda-orthoclase, microcline or oligoclase), and muscovite or biotite mica, or both. Typical granite has muscovite. Where biotite alone is present it is called granitite. Where hornblende or tourmaline replaces the mica, the rick is called hornblende- or tourmaline-granite. Where feldspar fails and only quartz and mica remain, the rock is called greisen. As accessory constituents might be mentioned, zircon, allanite, cassiterite, rutile, titanite, magnetite. By a gradual decrease of quartz the granites pass inperceptibly into the syenites (to be described later), and by similar changes into the diorites.

There is a form of granite called pegmatite, which is found in veins or dikes. It is very coarsely granular. The crystals of feldspar sometimes measure a foot or more in diameter, while the quartz and muscovite crystals correspond in size. Pegmatite is the source of nearly all of the white mica of commerce. It is also remarkable as being the home of a variety of extremely rare minerals — compounds of thorium, lanthanum, yttrium, etc.— among which may be mentioned uraninite or pitch-blende, the present source of radium. Pegmatite is characterized by the interesting parallel intergrowth of feldspar and quartz called graphic granite. Pegmatite is particularly noteworthy, however, as having been deposited from an intensely heated aqueous solution, perhaps from vapor of water (mingled with other gases, such as carbonic acid, hydrofluoric acid, boracic acid, etc.), which was under such great pressure that it bordered on the fluid condition. The minerals of pegmatite, more particularly the quartz crystals, are frequently filled with fluid inclusions of water or carbonic acid. A great variety of minerals and a few rocks are considered to have been formed in this manner, and are said to be of pneumatolytic origin (Greek, πνεῦματόω, to turn into air), and such processes are termed pneumatolytic processes. Furthermore, since these processes usually succeed some great volcanic outbreak, they are termed post-volcanic processes.

The granites as a family have a range in silica which varies between 65 and 80 per cent.

Where a magma of the chemical composition of granite erupts it may form dikes, sheets or flows. The rocks may have a variety of colors, but they are prevailingly light ashy gray. Where crystalline, they possess the same mineral constituents as granite, except that the feldspar is apt to be the glassy variety of orthoclase called sanidine. The porphyritic texture prevails among the intrusive and extrusive forms alike.

The geologically older intrusives of this family are called quartz or orthoclase porphyry according to whether the phenocrysts imbedded in the felsitic ground-mass are quartz or orthoclase. The strictly extrusive forms of granitic composition are known as rhyolites (from the Greek word which means to flow), so called because of the flow-structure which is commonly developed in them. The rhyolites are rarely holocrystalline, containing nearly always more or less glass and occasionally consisting wholly of it. These entirely glassy forms of rhyolite are called obsidian. Perlite and pitchstone are varieties of obsidian. Occasionally the rhyolites are frothy in character, due to the rapid escape of steam resulting from the relief from great pressure. This form is known as pumice. Rhyolite is also called liparite because extruded abundantly from the volcanoes of the Lipari Islands.

**Syenite.**— The hornblende granites, as already explained, are those in which the mica has been replaced by hornblende. An occurrence of such a rock at Syene (now Assuan) on the Nile, was called syenite from its locality. Of late the term has been restricted to quartzless rocks consisting primarily of orthoclase and hornblende. Rocks of the syenite family usually carry varying amounts of plagioclase and may contain subordinate quartz. Apatite, zircon. titanite and magnetite are uniformly present as accessory constituents. In texture they are granitoid and, by an increase of quartz, grade over completely into the granites, or by an increase of the plagioclase pass over into the diorites (described below). Where augite replaces the hornblende the rock is called augite-syenite; where mica replaces it, minnette. Nepheline and orthoclase constitute nepheline-syenite.

The range in silica percentage for the typical syenites is between 55 and 65 per cent.

When a magma having the chemical composition of a typical syenite erupts it forms dikes, sheets and flows, closely resembling the eruptive forms of granite, but without quartz. The loosely applied mining term porphyry is used indiscriminately for the eruptive members of both the granite and syenite families. True eruptive syenite, however, is called trachyte, from the Greek word which means rough. The most typical occurrences are light-colored, ashy-gray rocks, either aphanitic or porphyritic in texture, with usually some glass in the groundmass. When porphyritic the phenocrysts are of the glassy variety of orthoclase called sanidine. In fact, the entire felspathic constituent is chiefly of this variety.

The eruptive rock having the composition of nepheline-syenite is called phonolite because of the ringing sound which thin plates make when struck with a hammer.

**Rock-Families: II. Basic Division; Diorites.**— These diorites are plutonic rocks having a silica percentage running from 50 to 65 per cent. They are of medium acidity and the magmas from which they are formed may be considered as approaching closely the hypothetical parent magma from which, by the process of cleavage, the other rock-families, acid, basic and very basic, may be thought of as having originated. Mineralogically they consist of hornblende and plagioclase feldspar. Those in which mica replaces a part of the hornblende are called mica-diorites, while the same constituents plus quartz go by the name of quartz-diorites or granite-diorites. These rocks mark the transition to the granites. Augite-diorites are rocks of the diorite type, in which hornblende is replaced in part by augite. They grade over into the gabbros.

Extrusive rocks having the chemical and mineralogical composition of the diorites are called andesites. Typical andesites are aphanitic, felsitic or porphyritic in texture and closely resemble the trachytes, the main distinction being that they contain plagioclase (andesine or oligoclase) instead of orthoclase. The ferromagnesian constituent is usually hornblende, but may be either biotite or augite. The rocks are named because of their common occurrence in the Andes Mountains.

Acid andesites containing free quartz are known as dacites, a name derived from the old Roman province of Dacia, now a part of Hungary.

**The Gabbros.**— The gabbros are coarse- to fine-granular, granitoid rocks of plutonic origin, having a silica percentage ranging from 45 to 55 per cent. As originally defined they consisted of plagioclose (labradorite) plus a pyroxene, of the variety known as diallage; but more recently the name has been applied to a great variety of rocks consisting of a plagioclase (at least as basic as labradorite) plus any kind of pyroxene, either monoclinic or orthorhombic. If olivine be present it is known as olivine gabbro.

The name norite is applied to that member of the gabbro family which consists of plagioclase and enstatite. If olivine be present it is called olivine-norite. The ferromagnesian constituent may fail and the rock thus consist of labradorite feldspar alone, in which case it is known as anorthosite (from the French word for triclinic feldspar).

The accessory mineral constituents are apatite, titanite, ilmenite, magnetite. The first and last mentioned are usually abundant, and the latter may segregate to form ore deposits.

**Diabases.**— These may properly be discussed in connection with the gabbros, for they have the same mineralogical composition. Their chief distinguishing feature perhaps is their texture, which under the microscope, if not in the hand-specimen, is seen to be ophitic. This, in short, is the essential distinction between the gabbros and the diabases as ordinarily considered. In granularity they range from coarse to aphanitic. They are sometimes strikingly porphyritic, with perfect automorphic phenocrysts of augite imbedded in an aphanitic, ground-mass of augite and plagioclase (labradorite or anorthite). The basalts or traps are the dense black aphanitic extrusive equivalent of diabase, but they grade over into the diabases by imperceptible stages. The basalts constitute great surface flows of unparalleled extent, covering thousands of square miles. On cooling they frequently break, by shrinking, into hexagonal prisms, which have their long diameters normal to the cooling surfaces. This is known as the columnar structure of basalt, so famously exhibited at the Giant's Causeway, on the northeast coast of Ireland.

Olivine is a more or less constant mineral in the basalts, which have been divided into the olivine-free and olivine-bearing varieties.

**Very Basic Division: Peridotites, Pyroxenites, Hornblendites and Dunites.**— Rocks of this division, as already explained, include those from which not only free quartz has disappeared, but also the feldspars, at least as notable constituents. They consist essentially of a mixture of ferromagnesian constituents plus one or more of the ores. Olivine and pyroxene (usually augite) together constitute peridotite (from the French word for olivine). If hornblende be substituted for augite the rock is known as hornblende-peridotite. If the rock consists essentially of pyroxene it is called pyroxenite; or of hornblende alone, hornblendite, or of olivine alone, dunite. They have as accessory constituents magnetite, chromite, ilmenite and apatite. Chromite rarely occurs in such abundance in the peridotites as to be of economic value.

A certain rare basaltic rock of the mineralogical composition of peridotite, consisting of augite and olivine in a glassy ground-mass, occurs at Limburg in Kaiserstuhl, Baden. It is called limburgite. Dense porphyritic rocks consisting of augite and magnetite in a glassy ground-mass represent the effusive member of the pyroxenites and are called augitites.

**Pyroclastics.**— Igneous rocks belonging to any of the above families may, by violent eruptions, be blown into fine particles known as ash, or if coarser as lapilli or bombs. These may accumulate and ultimately consolidate, the fine-grained material constituting tuff, the coarser material being known as volcanic breccia or agglomerate. See PYROCLASTIC.

## SEDIMENTARY ROCKS.

**Rock Disintegration.**— Granite is one of the most abundant and widespread of igneous rocks, and is a most important species among the numerous other primitive rocks of the lithosphere. The changes which take place in it in the process of its decay can be taken as illustrative of those which take place in the disintegration of all other primitive rocks. Granite consists of quartz, orthoclase feldspar (with some soda-orthoclase microcline or plagioclase), and light or dark mica, or both, or perhaps hornblende in place of the micas.

On decomposition under the influence of atmospheric agencies it falls to a more or less rusty, clayey mass of sandy or gravelly material, the sandy or gravelly part consisting of angular fragments of the original quartz (which is practically unaffected by atmospheric agencies), and fragments of still undecomposed feldspar. The clayey portion of the alteration products results from the decomposition of the feldspar and consists largely of kaolin, which in a pure condition is a white powdery or plastic material, according to whether it is dry or wet. It is usually stained rusty brown by iron oxide, which results from the decomposition of any ferromagnesian constituent contained in the rock or from small particles of some one of the ores which are quite certain to have been present in small amounts. Certain constituents of the original minerals are carried off in solution; the alkalies and a part of the silica of the feldspars; also a portion of the iron of the ferromagnesian minerals, together with some of the magnesia and much of the lime that may have been present as a minor constituent.

This mass of loose, more or less rusty, incoherent material remaining behind is termed residual granite. Rocks of whatever nature are in like manner subject to decomposition by atmospheric agencies, and their residual materials everywhere cover the greater portion of the surface of the underlying rocks, and constitute what is termed mantle-rock or detritus. A part of this mantle-rock consists not of residual material in the strict sense, but is made up of angular fragments of various sizes, which have been broken from the rock-masses by the action of frost. At the foot of nearly every steep cliff is to be found an accumulation of angular rock-fragments called talus, rock-slide or breccia.

**Removal of Rock-waste and Its Deposition in the Form of Sediments.**— Most of the various materials of the mantle-rock, whether residual or fragmental, find their way sooner or later, chiefly by the action of rain or frost, to the neighboring streams, and are borne by them to the rivers, which in turn transport them, after numerous halting-periods, to the sea or to smaller bodies of salt or fresh water. In this process of transportation the angular rock-fragments are reduced by attrition to rounded pebbles. The angular grains of quartz also become rounded and water-worn, while much of the material becomes reduced to an impalpable mud. These more or less finely comminuted and abraded materials are distributed along the shores of lake or sea. Gradually the finer, more easily suspended and transportable materials are carried out into deep water, the finest and most impalpable muds being transported farthest from the shore; so that, broadly speaking, the washings from the land surface become distributed over sea and lake bottom in order of fineness, beginning with the coarsest gravelly materials at the shore-line, and growing successively finer toward the deep water, where finally only the impalpable silts and muds are deposited.

**Stratification.**— In addition to this more or less gradual horizontal change from coarse to fine material brought about by the transporting power of water, there is always to be observed a much more sudden and abrupt change vertically, by which materials of various sorts and degrees of fineness are arranged by the sorting power of the same medium (water) into horizontal beds of varying thickness, which are separated from each other by sharply defined planes of demarcation called sedimentation or bedding planes. Beds which consist of the same material mineralogically are called strata. But a stratum may be made up of thinner beds, owing to a difference in the fineness of the material which composes it. These subdivisions of a stratum are called layers, and layers in their turn may be composed of extremely thin beds, only the very small fraction of an inch in thickness, called laminæ. Strata vary in thickness from a few inches to several feet. All materials deposited in water are called sediments; and all sediments were originally deposited in nearly horizontal position. These nearly horizontal strata slope or dip slightly toward deep water, and this slight inclination is known as initial dip. All materials deposited in water are stratified, and this is the chief characteristic of all rocks so formed. Rocks of this character are called sedimentary.

**Consolidation of Sediments into Coherent Rock-masses.**— Sediments have accumulated to a very great thickness during geologic time. Those sediments which have been deeply buried and have been subjected to great pressure have been made to cohere either as a direct result of this pressure or by cementing together of the particles by mineral substances in solution; namely, silica, carbonate of lime, or some compound of iron. These rocks of sedimentary origin may be further classified as aqueous, eolian, or glacial, depending on whether they are formed by water, wind, or glaciers.

**Rocks of Aqueous Origin.**— Rocks deposited in water are usually stratified. In this respect they are distinguished from typical igneous rocks, which are unstratified and massive. Aqueous rocks can be classified as follows: (1) Mechanical sediments of terrigenous origin; (2) sediments of organic origin; (3) chemical precipitates.

**Mechanical Sediments of Terrigenous Origin.**— Included here are all those substances which have been washed from land surfaces and deposited in the seas or other bodies of water, as above explained. The principal varieties are: (1) Conglomerates, otherwise known as pudding-stones. These are solidified gravels, in which coherence is due to some cementing principle (lime, iron, or silica), to pressure, or to both. Where the fragments of rock are angular, as though freshly broken, the rock is called breccia. Breccias are not all of water origin. They are occasionally terrestrial. In either case they have not been transported far from the parent ledge, as their sharp corners indicate. (2) Sandstones, consolidated sand-beds. Where the cement is calcareous they form calcareous sandstones. They are also called silicious or ferrugenous, according to the character of the cement. Argillaceous sandstones contain an admixture of clay. Coarse sandstones containing grains of undecomposed feldspar are called arkose. (3) Shales, solidified clays or muds. They may contain some sand, and are then said to be arenaceous; or they may contain lime in the form of shell-fragments or impalpable limy material, and are lacustrine; and those made by rivers are alluvial or fluvial.

Mechanical sediments of the character above described accumulate alike in seas, in lakes, and on river flood plains. Those deposits made in the sea are called marine; those made in lakes, lacustrine; and those made by rivers are alluvial or fluvial.

**Sediments of Organic Origin.**— These may be the result of the accumulation of either animal or plant remains. The accumulation of hard parts of animals, such as the shells of mollusks and other mollusk-like forms, the framework of coral polyps and echinoderms, and the microscopic skeletons of some of the protozoans, form the bulk of limestone and other chemically similar deposits. Coquina, the Florida limestone, is composed of a mass of mollusk-shells; crinoidal limestones of the fragmentary skeletons of those marine forms so abundant during Paleozoic time. Coral limestones are formed by the building up of coral reefs and by the accumulation of fragmentary coral materials and finely divided coral muds, which may be distributed widely over the floor of the ocean by currents, forming compact calcareous rocks. Calcareous accumulation of this particular sort are considered to have been changed to dolomites by the action of the salts of magnesium in the sea-water, on carbonate of lime, replacing part of the calcium by magnesium and forming (Ca,Mg) $CO_3$ out of $CaCO_3$. This imperfectly understood process, by which limestones are changed to dolomites, is called dolomitization. Dolomites and limestones grade into each other and together are among the most common and important rocks of the lithosphere.

Chalk is an accumulation of minute calcareous shells secreted by the lowest forms of animal life, the protozoans, certain forms of which abound in the surface waters of the oceans. When they die their shells rain down through the water and accumulate on the floor of the high seas, forming oozes. The chalks are considered to have originated in a similar manner during past geologic time.

Chief among the accumulations of plant remains is peat, an accumulation of vegetable materials in swamps or moist places. It is a dark brown or blackish residuum left by the partial decomposition of mosses and other vegetable accumulations, not always made strictly in the water, but always in moist places, and usually in the waters of swamps. Similar vegetable accumulations on a most extensive scale have been formed during past geologic time, and now constitute beds of lignite and bituminous and anthracite coal. Diatomaceous or infusorial earth is a silt-like deposit consisting mostly of the microscopic silicious shells of that low order of plants called the *Diatomaceæ*.

**Chemical Precipitates.**— Briefly enumerated, these are salt and gypsum, found in alternating beds, and considered to have formed by the evaporation of salt lakes, or by the isolation and evaporation of bodies of sea-water. Calcareous sinter or tufa consists of carbonate of lime, which has been brought up in solution in the waters of hot springs and deposited as porous or cellular material about their vents. It is also deposited from solution in the waters of rivers and lakes, and occasionally forms deposits of considerable extent. Travertine is a more compact form of the same material, as is also Mexican onyx.

**Eolian Rocks.**— In regions unprotected by vegetation, as long sea-beaches, the shores of lakes, or in the region of deserts, the finer sands are picked up by winds and drifted like snow into oval or rounded hillocks called dunes. Often these drifting sands are a menace to agriculture, since they gradually encroach upon and bury under them, the arable land. Sands thus deposited by winds are only rudely stratified. In the same manner fine impalpable dust is transported long distances, and gradually accumulates to form loess. The loess deposits of China are locally over 1,000 feet thick. Similar accumulations occur in the United States, Europe, and in Argentina. The Mississippi Valley loesses are believed by some to have been laid down in water under unusual conditions. True loesses are unstratified, and have a characteristic verticle cleavage.

**Glacial Deposits.**— The great continental glaciers that, geologically speaking, existed only yesterday over a large portion of the continents of the northern hemisphere, left behind them vast amounts of characteristic material, which was in part deposited by the glaciers directly and in part by the waters resulting from the melting of the ice. These latter deposits are, therefore, partly of aqueous origin, and are called fluvio-glacial. Glacial drift is the general term applied to all the materials resulting from glacial action direct or indirect. Glacial till is the dense bluish clay, with numerous imbedded bowlders, characteristically striated. formed underneath the glaciers (sub-glacial material). This till-sheet (or ground-moraine) is found over a large portion of the area covered originally by the glaciers, and varies in thickness from zero to hundreds of feet. Other sub-glacial accumulations are called drumlins, till-billows, till-tumuli, crag-and-tail, etc. Materials dumped down at the margins of the glaciers in confused heaps are termed moraines (terminal, lateral, or medial). Streams flowing within or underneath the glaciers deposited along their courses material (sand, gravel, clay), which remained behind after the melting of the glaciers in elongated ridges called eskers or osars. Where these streams issued at the margin of the ice-sheets they left irregular mounds called kames. Streams flowing on the surface of the ice would likewise accumulate materials of the same sort, which would remain after the melting of the ice as long serpentine ridges known as super-glacial kames or eskers. These floods of water escaping from the glaciers carried the gravels, sands and silts far beyond the margins of the glaciers, and deposited them as deltas, fans, overwash aprons, and valley trains.

### METAMORPHIC ROCKS.

**The Metamorphism of Sediments.**— Those most ancient of all sediments which were derived from the disintegration of the original or primal rocks of the lithosphere, and which were first deposited in the primordial seas, have been so deeply buried in the crust of the earth as to have been affected by the uprising heat of the earth's interior. This heat, united with the tremendous pressure exerted by the superincumbent mass of sediments and the dissolving effect of the intensity (super-) heated mositure present have changed these old rocks into thoroughly crystalline masses, consisting of distinct mineral aggregates more or less resembling the crystalline rocks of the igneous type, but different from the latter chiefly in this, that the original stratification (bedding) planes are still visible. Such rocks are utterly changed in everything except their chemical composition from their original condition and appearance and are said to be metamorphosed. As a class they compose the metamorphic rocks. It is not alone these ancient sediments which have suffered transformation. Sediments of every geologic age have been found in some quarter of the globe in the metamorphosed condition.

There are two kinds of metamorphism: contact and regional. Contact metamorphism is produced by the heat of intruded masses of igneous material upon the surrounding rocks. The contact zone or area about the intrusion affected by its heat is usually narrow, but it may extend for rods or even miles from the intruded mass. The changes resulting from contact metamorphism are not so important in the production of altered rock-masses as they are in the formation of new minerals, so that they are of more especial importance to the mineralogist.

Regional metamorphism, on the other hand, as the name implies, has been exerted over wide areas, and has produced the most profound and far-reaching effects. By it the rocks over many thousands of square miles have been completely altered from their original condition. As a result of pressure the older deeper-seated rocks (as well as some of the more recent ones) have been intensely folded, plicated and sheared, which folding and shearing alone would be sufficient to alter them completely. Metamorphic rocks have other structures developed in them, such as crushing; jointing (series of more or less parallel cracks intersecting each other at nearly right angles and breaking the rock-masses into blocks with rudely parallel sides); faults (produced by the slipping of the walls of rock on either side of a fissure over each other); slaty cleavage (produced by great pressure exerted at right angles to the cleavage surfaces); fissility (the visible separation of rocks into thin plates, also due to pressure, and attended by slight movement of the plates on each other); schistosity or foliation (the property of splitting into plates with rough undulating surfaces, due to the parallel orientation of the mineral crystals). This may be cleavage, fissility, or both.

The same processes of metamorphism, so potent in the transformation of true sediments, are just as efficacious in producing changes in the igneous rocks themselves, by virtue of which processes the igneous rocks frequently become so profoundly altered as to be utterly unrecognizable.

The metamorphic rocks as a class are completely crystalline, and in this respect resemble the igneous rocks of plutonic origin. Their chief varieties will now be considered.

**Gneisses.**— Disintegrated or residual granite consists of disaggregated particles of quartz and more or less thoroughly kaolinized feldspar, with considerable true clayey residue resulting from the complete decomposition of some of the feldspar, all somewhat tinged by the oxide of iron. It is easy to see how a similar assemblage of materials could be brought together upon a sea-beach. By a subsidence of the area and a continued deposition of other sedimentary materials above them, that first assemblage of sand and clay might become so deeply buried as to come within the sphere of metamorphic action. If subjected to heat and pressure, the elements present would recrystallize as quartz, feldspar and mica. In being so altered it would not necessarily have its original bedding-planes obliterated, and the rock would have the mineralogical composition of granite, but obviously would be of sedimentry origin. A metamorphic rock of such a character would be called gneiss. In the same manner a variety of mixtures might be altered with the same result. Conglomerates are known thus to pass by imperceptible gradations over into gneisses. An arkose might alter to gneiss. If the material originally contained much iron, then hornblende, or some other ferromagnesian mineral, such as biotite or augite, would result and the rock would accordingly be called hornblende-, biotite- or augite-gneiss. Garnets might result from the metamorphism and the gneiss would then be called garnetiferous.

Igneous rocks such as granites, syenites or gabbros, by process of metamorphism, may be altered into gneissic rocks. The chief metamorphic factor in the changing of igneous rocks to gneisses is, however, intense pressure, as a result of which even these most resistent of all rock-masses are made to flow like some viscous substance. This flowing, which is accompanied by more or less shearing, results in producing schistosity or foliation, which is accompanied by a distinct banding closely simulating original bedding, so that the rocks lose their original massive form and come to resemble altered sediments. A granite in which this secondary banding or foliation had been produced would be called a granite-gneiss; a gabbro similarly altered would be termed a gabbro-gneiss, etc. In general we can say that a gneiss is any holocrystalline, foliated, metamorphic rock, of either sedimentary or igneous origin, which has the mineralogical composition of some one of the plutonic igneous rocks. It is frequently impossible to determine whether certain rocks are true sediments or altered igneous rocks.

**Schists.**— The term schist is applied to any metamorphic rock which, on account of the parallel arrangement of its crystal particles, tends to split more or less perfectly in parallel planes (schistosity or foliation). Clay upon metamorphosis yields mica. If little iron be present it furnishes muscovite (or sericite, its hydrated form), but if much iron be present it produces biotite. From this it follows that clay-beds on metamorphosis furnish mica of some sort or other, and as the rocks are always distinctly foliated, owing to the invariable parallel orientation of the mica-scales, they are called muscovite (or sericite) or biotite schists or, in more general terms, mica schist. Some quartz and feldspar may be present, but if subordinate they are still reckoned among the schists. Rocks of this character mark the transition of the schists into the gneisses. Mica-schists range in granularity from coarse- to fine-crystalline, the fine-crystalline varieties being called slates.

Quartz-schists are essentially quartz-rocks which contained originally some disseminated clay that altered to mica, as a result of the presence of which the rock has a schistosity. Many basic igneous rocks of the diabase order on metamorphosis change to hornblende-rocks. Where they are foliated they are called hornblende-schists. If more or less massive they are termed amphibolites. The diabases are very apt, however, to alter to chlorite schists, especially if the original augite was of the aluminous variety, and they may alter to biotite schists.

**Other Metamorphic Varieties.**— Pure quartz-sand metamorphoses to a holocrystalline rock called quartzite. Limestone metamorphoses to a more or less coarsely crystalline rock consisting of grains of calcite. If fine, even-granular, it is known as marble. If coarse-granular, it is called crystalline limestone or simply limestone. But the term marble is used to embrace all crystalline calcite rocks that are susceptible of a polish. Serpentine results from the metamorphosis of basic igneous rocks consisting largely of the non-aluminous varieties of hornblende or pyroxene and olivine. The peridotites are especially susceptible to this change. Anthracite coal results from the metamorphosis of bituminous coal, which in turn is derived from peat or lignite. In certain extreme cases of metamorphism anthracite becomes altered to a graphitic material.

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**ROCKVILLE**, rŏk'vil, Conn., city in Tolland County and on the New York, New Haven and Hartford Railroad, about 16 miles east-northeast of Hartford. Electric lines extend to Hartford, Ellington and other places. Shenipsit Lake, nearby, is more than two miles long and drains into the Hockanum River, which has here a series of falls, making in all a descent of 280 feet and furnishing Rockville with exceptional water power. The city was settled in 1716 by a colony from East Windsor and was a part of the town of Vernon until 1889 when it was chartered as a city. There are about 20 manufacturing establishments of importance, chief of which are envelope factories, silk and woolen mills, gingham and satinet factories. The principal public buildings are the schools, churches and the library. The latter cost over $100,000. There are eight churches, a high school, public and parish schools, two private schools and a public library. The government is administered by a board of aldermen, four members, and a council of eight members. Pop. about 8,000.

**ROCKVILLE CENTRE**, N. Y., village in Nassau County, Long Island, five miles east of the New York City line and 10 miles southeast of Jamaica. It is situated in an agricultural district and is largely residential. There are oyster and fishing interests and an increasing population. Pop. (1920) 6,262.

**ROCKWELL, Alphonso David**, American physician: b. New Canaan, Conn., 18 May 1840. He was graduated at Kenyon College in 1868 and at the College of Physicians and Surgeons in New York. He is a specialist in electro-therapeutics and neurology, having held a professorship in the former subject in the Post-Graduate School of Medicine and also in the New York State Women's Hospital. He was one of the three commissioners appointed to give advice on the establishment of the new method of execution by electricity adopted by the State of New York. He is the author of ‹Relation of Electricity to Medicine and Surgery›; ‹Nervous Exhaustion› (1901); and, with G. M. Beard, ‹Treatise on the Medical and Surgical Uses of Electricity› and of many contributions to the medical press on neurology and physical methods of treatment. During the Civil War he was surgeon of the 6th Ohio cavalry in Sheridan's corps. He is neurologist-emeritus to the Flushing Hospital.

**ROCKWOOD**, Tenn., city in Roane County, on the Cincinnati, New Orleans and Texas Pacific and the Tennessee Central railroads, about 60 miles west-southwest of Knoxville and 88 miles north by east of Chattanooga. It is in a coal region in which there are extensive deposits of iron ore. The chief industrial establishments are blast furnaces, foundries, machine shops, coal yards, hosiery mills and lumber yards. The trade is chiefly in coal and in iron products. The value of taxable property is $800,000. There are a high school and grammar school. The government is vested in a mayor and a board of five aldermen. The municipal receipts approximate $25,000 yearly. Pop. 5,000.

**ROCKY FORD**, Colo., city in Otero County, on the Arkansas River, 53 miles south of Puebla, on the Atchison, Topeka and Santa Fé Railroad. It is situated in a rich irrigated farming district, is famous for the cantaloupes bearing its name and is largely devoted to the sugar-beet industry. There are canneries, creameries and beet-sugar factories. Pop. 3,746.

**ROCKY GAP, Engagement at.** On 5 Aug. 1863 Gen. W. W. Averell, with a brigade of cavalry and mounted infantry and a six-gun battery, left Winchetser, Va., for a raid into West Virginia, which was to be continued to Lewisburg and the Virginia and Tennessee Railroad. He moved by way of Wardensville to Moorefield and to the upper valley of the south branch of the Potomac, and then to Huntersville, driving back Col. W. L. Jackson's cavalry. As he approached White Sulphur Springs, on the morning of the 26th, he encountered Col. Geo. S. Patton, who, with four small organizations of infantry, two battalions of cavalry and a battery, in all about 1,900 men and four guns, had been ordered to intercept him, and had taken position at Rocky Gap, the junction of the Huntersville road with the Lewisburg and Kanawha turnpike. Patton was strongly posted and Averell opened upon him with artillery and disabled two of his guns; but successive charges by Averell's dismounted force, with efforts to flank him, continued during the entire day, failed to dislodge him, and at night, after nine hours' fighting, the contending forces occupied the same positions as in the morning. Averell intended to renew the fight next morning, but, learning that Patton had received reinforcements from Lewisburg, made arrangements to withdraw. At 10 A.M. Patton attacked his left and half an hour later Averell ordered a retreat, which was conducted in good order on the road to Warm Springs, and thence by way of Huntersville to Beverly, which was reached on 31 August. The Union loss was 25 killed, 125 wounded and 67 missing, a total of 217; the Confederate loss was 20 killed, 129 wounded and 13 missing, a total of 162.

**ROCKY MOUNT,** N. C., city in Edgecomb and Nash counties, one mile from Tar River, 120 miles northwest of Wilmington, on the Atlantic Coast Line. It has a university school, a large trade in cotton and tobacco, and manufactures machinery, fertilizers, lumber, yarns, hosiery and cotton-seed oil. The city is growing rapidly. Pop. (1920) 12,742.

**ROCKY MOUNTAIN GOAT,** a goat-antelope (*Oreamnos montanus*), related to the chamois and serow, which inhabit the heights of the Rocky Mountains and Cascade Ranges between the forests and the snow line, from the 44th to the 65th degree of latitude. It is about the size of a common goat, but is stouter, handsomer and has stronger legs. It is completely covered with long, thick, white hair, which forms an erect mane along the middle of the back from between the horns to the root of the tail; the shoulders are rather humped and the head is habitually carried low. Both sexes have slender, smooth, black horns, curving backward, about eight inches long and sharp-pointed. Its pure white coat is a capital protection against observation in the midst of the mountain snow, and is unique, as no other white ruminant is known. Dwelling in such solitudes they have little to fear from natural enemies and fall an easy prey to the human hunter who has the hardihood to pursue them upon the rough mountain peaks and skill enough to get near to them unobserved. «Their food,» says Wister, «seems to be chiefly the short almost lichen-like moss that grows on the faces and at the base of the rocks, and between them in the crevices. . . . I am inclined to believe that the goat keeps consistently to the hills, whatever the season may be, and in this differs from the mountain sheep, as he differs in appearance, temperament and in all characteristics, except the predilection for the inclined plane; and in this habit he is more vertical than the sheep.» A variety from the Copper River region, in Alaska, is marked by a greater divergence of horns and some other structural characteristics and has been called *O. kennedyi*. The flesh of the mountain goat is not highly esteemed, but its hair was utilized in weaving by the Indians of British Columbia and the coast northward; and its tanned hide has a value in market as a rug. Consult Stone and Crane, ‹American Animals› (new ed., 1914), and authorities on travel and sport in the Northwest.

**ROCKY MOUNTAIN NATIONAL PARK,** created by an act of Congress approved 26 Jan. 1915, is located in the northern part of Colorado and has an area of 358½ square miles. It includes the principal part of the Rocky Mountain Range, the highest point being Longs Peak, which is 14,271 feet, and 14 mountain peaks that are over 13,000 feet above sea-level. The park is accessible to tourists and travelers at numerous points on the eastern and western boundaries, where trails have been in existence for a number of years. The most central point from which the public can enter the park to different points therein is Estes Park, a small village located about three miles from the nearest point to the park boundary and approximately 7½ miles from the main entrance where the Fall River road enters the park. The nearest railroad stations to Estes Park are Lyons, Colo., 22 miles; Loveland, 33 miles; Fort Collins, 46 miles; and Boulder, 40 miles. Automobile stage lines during the tourist season make regular trips at special rates between these points and Estes Park. Consult Trowbridge, C. R., ‹Rocky Mountain National Park› (Department of the Interior, Washington 1915 et seq.).

**ROCKY MOUNTAIN SHEEP.** See BIGHORN; SHEEP, MOUNTAIN.

**ROCKY MOUNTAIN SUBREGION,** a rather indefinite zoogeographical region embracing the elevated area occupied by the Rocky Mountains, which zoologically presents certain peculiarities very noticeable to a traveler from either the eastern lowlands or the Pacific Coast. The resemblance in the fauna is, indeed, rather to the East than to the West, as the Rockies do not form a zoological «divide» to anything like the extent which the Sierra Nevada does, nor even as completely as does the line of deserts which occupy the great depression of Nevada and Idaho between the Wahsatch Range and the Sierra Nevada.

A large number of species of animals and plants extend from the Mississippi Valley to and throughout the Rocky Mountains, in forms which are identical from one side of their wide range to the other, or which shade indistinguishably from one varietal extreme in the East to another in the West. On the other hand the plants and animals common to both California and Colorado are comparatively few. The dry and foodless deserts of the Utah basin form a more potent barrier than the snows and altitude of either Sierras or Rockies. Thus the buffalo formerly wandered throughout the whole network of interior valleys, and there is a special variety which seem never to have left the park-pastures and scantily timbered defiles; yet Bear River, Utah, on the border of the alkali basin, is the farthest west they ever got south of northern Idaho. The elk, grizzly and bighorn, the mountain goat, white ptarmigan and certain other examples of animals, are common to both the Sierra Nevada and the Rocky Mountain systems; but in all these cases they are species whose range extends far north where both lines of elevation converge in British Columbia. Yet the true «blacktail,» or Columbian deer, is never shot east of the Cascades, nor does the Virginian, or willow deer, common enough in the Rockies, wander over to the Cascades or Sierras of Oregon and California.

To a more limited extent the Great Plains on the east serve as a barrier between the commingling of plants and animals indigenous to the mountains on the one hand and the Mississippi Valley on the other. And that this, as far as it goes, is a real barrier, is shown by the fact that many common weeds and trees, which flourish well in Colorado now, had never reached there until carried, either intentionally or accidentally by man; that is, the place was suitable enough to them, but they had never been able to reach it.

The Rockies, then, form a zoogeographical district, which embraces practically the whole system of complicated chains from New Mexico to the borders of Alaska, and there is a curious homogeneity throughout, a long list of insects, mollusks and animals of the lower classes, as well as of trees and herbs, occurring from the Rio Grande to the headwaters of the Saskatchewan, disregarding the difference in latitude, which in flat regions is the most powerful factor governing the distribution of animal and plant life.

This is not exceptionally the case in the Rocky Mountains alone, though here it is conspicuous and well-marked. It is true of the Ural-Carpathian system, of the Scandinavian ranges, of the Andes, of the great East-African system, of which Mounts Kilimanjaro, Kenia and Gordon-Bennett are peaks; nor is it difficult of explanation. A great mountain-province is really a series of sub-provinces concentrically arranged, or, to put it in another way, heaped on top of one another, for the largest bound, embracing the whole extent of the mountains and their foothills, contains several more or less restricted areas, determined by altitude, just as a vast lowland province, such as the whole eastern half of the continent, contains several well-defined subdivisions according to zones of climate, succeeding one another from north to south. The cause of the natural division of these sub-provinces is precisely the same in both cases, for, whereas in the Mississippi Valley the cooler or warmer average temperature required by each animal or plant for its best development is obtained by moving to the north or to the south, so in a mountainous region too much cold or too much heat can be avoided by moving upward or downward, and climate varies with altitude instead of latitude.

Hence, naturalists who have studied the mountains are able to mark out successive sub-provinces, according to altitude, within the upper and lower borders of which certain forms of life are restricted, appearing neither below, or above, a limited number of thousand feet, except as occasional wanderers. Botanists have long recognized this.

Of course the number of varieties steadily decreases as one ascends just as on approaching the poles, because the means of supporting life diminish in proportion as a moderate climate and abundant vegetation are left behind. The hardy grizzly can stray to the utmost heights, as he is fond of doing, for his strength, power of locomotion and fasting abilities make it possible; but even he cannot remain there long, since food is very scarce beyond the timber. The eagle and greater hawks may soar above the naked icy crest of the loftiest summits, or perch upon the pinnacles, but they seek their prey and build their nests for the most part at far lower levels. A few small birds, like certain semi-arctic warblers and sparrows (especially the gay *Leucosticte* finches) and one large one (the well-known ptarmigan), the little-chief hare or «cony,» which stores in its rocky tunnels a winter larder of roots and stems gathered at the edge of the snow during the brief summer, and a small variety of beetles and other insects more or less subterranean in habits, alone brave the storms and famine involved in continuous residence upon the higher summits.

Next below lies the zone of hardy plants and of a longer list of animals, such as the Canada jay, dusky grouse, several hawks and owls, the kinglets, water-ouzel, snow-birds and *Zonotrichia* finches, the bighorn sheep and a large variety of insects and snails. Below that, down among the pines and abundant shrubbery of the lower slopes and the foothills, one finds in summer the full measure of Rocky Mountain life.

An examination of these facts discloses that all the inhabitants of the lofty plateaus and the rocky peaks are arctic animals and some of them, like the ptarmigan, turn white in winter in true arctic fashion. These creatures, finding the same conditions at those great heights to which they are accustomed at lower levels inside the polar circle, can live and flourish on an arctic island, as it were, in the midst of the temperate zone; the long narrow snow peaks of the great range forming a tongue of polar climate stretching half way to the equator. It has thus been possible for the beautiful white goat, whose proper home is in British Columbia, to stray south along the crest of the Sierra Nevada and Rockies as far as these high mountains run, but he must keep upon the very crest, whereas in Alaska he comes down to the shore. The insects and minute life of the peaks of Colorado belong to the same class with (are often identically the same species as) those collected by polar exploring expeditions. The same is true of plants. «Red snow» and arctic lichens may be gathered on Pike's Peak.

It is natural, then, that two different migratory movements should be observable in the Rocky Mountains; one the regular seasonal movement southward in the fall and back in the spring, affecting chiefly those birds that live at the base of the range, or near it; and another movement, which is regularly made by many animals, upward to the cooler and fresher pastures in the summer, and back to the less snowy and more sheltered dells near the base of the mountains as winter approaches. This vertical migration is very well understood in the case of the game, and the paths which the animals follow are often distinct.

The foregoing facts lead to an interesting generalization. While the southern peaks might be colonized by such stragglers from the north as the goat and the ptarmigan, whose legs or wings enable them to travel back and forth, there is a much longer list of small and practically stationary animals never found in the intervening valleys and totally unable to cross from one peak to another. Hence we must conclude that each lofty mountain top is a habitat by itself, entirely cut off from neighboring peaks where duplicates of its fauna and flora may be collected. On the tops of Mount Washington, in the White Mountains and Mount Marcy, in the Adirondacks, are insects and cryptogamous plants which do not occur anywhere between these isolated fragments of polar climate and the arctic circle, where the same butterflies, spiders and lichens are widespread and indigenous.

How shall this isolation of strictly circumscribed faunas upon mountain peaks be explained? Clearly it dates back to a time when communication between them existed. The icecap which, during the last Glacial Epoch, gradually overspread a large part of the north temperate zone and in the Rocky Mountain region covered the whole extent of their highlands with a thick mantle of snow and filled every canyon with local glaciers, of course crowded southward all the surviving life which had been wont, during the warm Tertiary time, preceding this cold period, to dwell far toward the north.

But when the epoch was on the wane, and the ice-front began to retreat, the relieved earth was again clothed with vegetation and re-tenanted by cold-loving animal life, which advanced northward closely in the rear of the retreating glacier. At a greater distance followed the more delicate animals and plants, gradually spreading northward as the moderating climate permitted, until they had established themselves in isothermal zones as we now find them. But as a subsiding flood will leave, stranded upon the top of the first points to appear above the surface, the driftwood and wreck of the deluge, so, as the warmth of southerly regions at a low elevation has increased, certain colonies of the advance guard of the army of animals and plants have found themselves stranded upon frigid mountain tops — islands of arctic climate — isolated from their fellows by warm valleys and plains in which their kindred speedily disappeared, overcome in the battle of life by the greater increase of lowland species to whom the circumstances were more favorable; but here on the high cold peaks they have been able to keep a stronghold, each in its own in a limited area, though surrounded by utterly fatal conditions.

Consult authorities cited under Zoogeography, especially the writings of C. Hart Merriam.

**ROCKY MOUNTAIN TROUT.** See Dolly Varden Trout.

**ROCKY MOUNTAINS, or CORDILLERAN SYSTEM,** the system of mountains which constitute the major axis of elevated lands of North America, in the western part, extending from the Arctic Ocean on the north to South America on the south, and parallel with the Pacific Coast. This great system of mountains is continued along the Pacific Coast in South America under the name Andes Mountains (q.v.). Between the Rocky Mountains and the Andes is a pass in Panama not many feet above sea-level. The width of the system varies; the greatest breadth is in the United States between lat. 38° and 42° N., where it is about 1,000 miles. The width diminishes north and south, increasing again in Mexico and diminishing only with the width of the continent. The highest point of the system is in Alaska, but the highest land mass is in the United States between 35° and 42° and on the eastern side of the system.

**Ranges.**— The ranges on the western boundary, and near the Pacific Coast are the Cascade and Sierra Nevada in the United States, the Sierra Madre in Mexico and Central America. West of the Sierra Nevada, in California, is the Coast Range. The Coast Ranges, Cascades and Sierra Nevadas are really separate mountain systems, folded at different times, and not genetically connected with the Rocky Mountains at all, although popularly spoken of as belonging to the Rocky Mountain System. The eastern chains in the United States, called the Rocky Mountain Range, extend north and northwest in the United States, approach nearer the Pacific in Canada, continuing into Alaska to the Arctic Ocean. On the east of the Rocky Mountain Range is the great central plain of the United States and Canada. Rising abruptly from this plain are many isolated cone-shaped peaks which gradually merge into ranges, forming an almost continuous eastern barrier, composed of short ranges, chief of which are Sangre de Cristo, Colorado or Front Range, Medicine Bow, Big Horn and Laramie. Farther east, in South Dakota and Wyoming, are the Black Hills, a mountain mass detached from the main ranges. In Wyoming the ranges divide, some extending southeast, others southwest and several short ranges having an almost east and west trend. Some of the well-known interior ranges are Wasatch, extending through Utah, and forming the eastern wall of the Great Basin, Wind River, Salmon River, San Miguel and Beaver River. Bitter Root Mountains form the divide between the headwaters of the Colorado and the Missouri rivers. In Nevada the short ranges are generally north and south; in the central and eastern part there are a large number of short, almost parallel chains. Other noted ranges are the Cœur d'Alene, the Lapwai and the Blue. The ranges south of the divide in Wyoming have a greater altitude than those north; but some of the southern ranges after leaving Colorado on the south and east end abruptly, and others slope gradually to the low desert plains. The greatest development is in Colorado.

**Peaks.**— In Colorado there are about 40 peaks which are over 14,000 feet in height. Among them are Grays Peak, 14,341 feet in height; Longs Peak, 14,271 feet; Pikes Peak, 14,134 feet. In the Sawatch Range, in Colorado, are Mount Harvard, 14,375 feet, and Mount of the Holy Cross, 14,176 feet. In the mesa region in western Colorado is Uncompahgre Peak, 14,408 feet; and in Sangre de Cristo Range is Blanca Peak, 14,463 feet. Other famous peaks, outside of Colorado, are, in Wyoming, Fremont's Peak, 13,700 feet, in the Wind River Mountains; Mount Hayden, 13,691 feet, in the Sawatch Range. In the Colorado, or Front Range, there are four peaks over 14,000 feet; in Sawatch Range, 10 peaks; in the Sangre de Cristo, three; in the San Juan, four; in the Sierra Nevada, four. In Park Range (not group) and in the Pikes Peak Group, there is one in each. The highest peaks belong to the Cascade Range. Mount McKinley in Alaska is over 20,000 feet above sea-level; Mount Logan is 19,500 feet; Mount Saint Elias, 18,101; Mount Rainier, 14,444. Many of the peaks of this vast system, especially in the Cascade Range, are extinct volcanoes. In Mexico and Central America there are a number of active volcanoes. Orizaba, 18,300 feet in height; Popocatepetl, 17,887 and Ixtaccihuatl 17,343, are among the highest active volcanoes.

**Plateaus.**— The great plateau region included in the Rocky Mountain system is in southern Wyoming, eastern Utah, eastern Arizona, western New Mexico and western Colorado. The lands in Colorado and New Mexico east of the mountain ranges belong to the Great Plain. The Plateau region is bounded on the north by Sweetwater and Wind River Mountains. The general elevation of the whole plateau is about 7,000 feet above sea-level, but in Colorado it has an elevation of 10,000 feet. The Continental divide crosses this plateau; and within its limits are the waters of the three great river systems of the United States, the Mississippi, the Colorado and the Columbia. The southern part of the plateau has in places an abrupt ending, a steep, almost perpendicular escarpment. The ranges crossing, divide the plateau region into sections to which have been given the names Kaibab, Kaiparowits, Aquarius, Colorado, Markagunt, Paunsagunt, Paria, Shiwits, Tavaputs, Uinkaret, and others not so well defined as those named. On these broad plateaus are groups of mountains, buttes and isolated ranges and peaks. There are seven peaks over 13,000 feet above sea-level; five over 12,000 feet and less than 13,000 feet; and 20 over 10,000 feet and less than 12,000 feet.

**Parks.**— The parks of Colorado are high mountain valleys, known as North, Middle, South and San Luis, with an elevation of from 6,000 to 10,000 feet, surrounded by ranges of mountains from 3,000 to 4,000 feet higher. The west border of the San Luis Park is formed by San Juan Range, with its high peaks, more than 100 of them over 13,000 feet, bordering it like giant watch towers. The Uinta Range is west of North Park. The Parks, or enclosed mountain valleys in Idaho and Wyoming, are not so high as the Parks of Colorado. The most famous park in the whole Rocky Mountain System is Yellowstone Park (q.v.) in Wyoming, now a government reservation. The ranges on the boundaries of the Parks and rising from the Park Valleys, are grouped together as the Park Ranges or Park System. The mountains so designated are bounded on the north by the Laramie Plains, and on the east by the Great Plains. The southern and western boundaries are indefinite. Other noted parks are Monumental Park and the Garden of the Gods, near Colorado Springs. The 500 acres are covered with an extraordinary rock formation, like giant spires and pillars, and some like vast cathedrals. The Yosemite Valley (q.v.) is often classed with the Parks.

**Desert Region.**— Within the area called by this name are vast arid regions, bare bleak mountains, and localities of almost barren lands, some of which might be made fertile by irrigation, and some fertile valleys. It includes the southern parts of Idaho and Oregon, the western parts of Utah and Nevada, the southeastern part of California, the southwestern part of New Mexico, the southern part of Arizona and the north central part of Mexico. The Sierra Nevada and Cascade ranges are on the western boundary; and the plateau drained by the Colorado River is on the eastern boundary. The greater part of this region is known as the Great Basin (q.v.) which has no apparent outlets to the ocean. The ranges, as in Nevada, are simple and narrow and separated by broad, level desert valleys. Geologically this basin is probably not strictly within the Rocky Mountain system.

**Passes.**— Several depressions in the ranges are called Passes, and some have been used for routes for railroads. A famous pass is the Lewis and Clark's, in lat. 47°. Through this pass the Northern Pacific Railroad has been built, and at Mullan's Pass it goes through a tunnel 3,850 feet long. The Truckee Pass, 6,000 feet above sea-level; the South Pass of the Wind River Range, Evan's Pass in the Front Range, which is crossed by the Union Pacific Railroad, are well known. In Canada the pass between Mount Hooker and Mount Brown, Athabasca Portage, is 7,300 feet above the sea. In the California mountains there are a number of passes. Where the rivers have cut their channels through the mountains, passes have been formed.

**Lakes, Rivers and Glaciers.**— The greatest rainfall is on the western slope, where the moisture brought by the winds from the Pacific Ocean falls. In the valleys and on the plateaus, especially where the waters fall down the escarpments, the rivers run through deep cañons, the most perpendicular sides of which are thousands of feet above the river beds. The rivers of the plateaus have their sources in the Park and Wind River Mountains, and in the Wahsatch Range. They have carved out deep gorges, which divide the region into a series of distinct plateaus. Some of the famous canyons of this region are the Grand of the Colorado, the Kanab and the Marble. The principal rivers within this region are the Green, Colorado, Sevier, Paria, Uinta and White. The rivers whose head waters are in the Sierra Nevada Range, flow to the Pacific, except a few, which flow east and are lost in the sands. The Sacramento and the San Joaquin are in the valley between the Sierra Nevada and the Coast Range. The one river comes from the north, the other from the south, almost parallel with the ranges until they unite, when they burst through the mountains and discharge their united waters into the Pacific Ocean. The Columbia is one of the great rivers of this region. Rising on the east side of the Cascade Mountains it flows south for some distance until finally it plunges through the mountains in a series of magnificent cascades, whence the name of the range. The Front Range in northern Montana bears upon its crest for many miles the continental divide which separates the headwaters of the Missouri and the Columbia rivers. The Bitter Root Range separates the Missouri from the Salmon. The greatest water systems of North America have head-waters in the Rocky Mountains. The Colorado toward the south, the Yukon on the north, and the Columbia are the largest streams that flow toward the Pacific; the Mississippi, the Great Lakes and the Saint Lawrence, and the streams that flow into the Hudson Bay all reach the Atlantic Ocean; and the Mackenzie and its tributaries flow into the Arctic. The Rocky Mountains have many small lakes, formed by springs, and depressions which serve as basins. In the Great Basin are several bodies of salt water, the largest of which is Salt Lake (q.v.). The only crater lake in the United States is Crater Lake in the National Park. The glaciers of the Rocky Mountains are numerous. In Alaska are the largest and greatest numbers among which are Muir and Malaspina. Mount Rainier (q.v.) has over 30 glaciers, extending over a space of 100 square miles, and some of the ice walls reach a depth of 1,000 feet. The Puyallup and Mowich rivers drain five of the largest glacier rivers of Mount Rainier. A notable feature of these rivers is what is known as glacial tides, which are quite marked in summer time. Between midday and a few hours before sunset, there is an increase in the flow of water at the head of each river; about two feet in the narrowest part of the rivers. The vastness of Mount Rainier may be conceived when it is known that the surface, including the hill country at its base, has an area of 3,000 square miles. In other parts of the Rocky Mountains are found vast glaciers, and many of the peaks are ever whitecapped with snow.

**Geology.**— Throughout the Paleozoic era, the region of the Rocky Mountains was low and featureless, and under the sea a great part of the time but with several local emergencies. Toward the close of the era, in the Permian epoch, it was probably a desert, and at this time were laid down the red sandstones and gypsum beds that form so striking a feature of the eastern ranges. Land conditions obtained through Triassic and most of Jurassic time, but the region was not mountainous. Again in the Cretaceous most of the region sank beneath the sea for a short time. During all its history thus far the most important fact was the accumulation over all the region of the great series of sedimentary rocks that make the bulk of the mountains. During the late Cretaceous the region again became land, low and swampy, with the accumulation of coal beds. At the close of the Cretaceous there began a period of folding, which compressed and crumpled the rocks and arched them up into a great series of folds that constituted the first appearance of the Rocky Mountains. In the northern Rockies the compression was so great that the rocks broke and passed into enormous overthrust faults (q.v.) along which the beds slipped many miles. Following the uplift erosion set in and has been continuously carving the region ever since. During Tertiary times the area was the site of very extensive volcanic activity that poured out the great lava flows of the Yellowstone Park and other localities. There have been one or two later periods of slight uplift and faulting, but no great folding since the close of the Cretaceous. The general trend of the folds and hence of the mountain ranges is nearly north and south, though a few lie nearly east and west. Erosion has planed off many of the folds, so as to expose cores of older granite, from which sedimentary beds dip outward in all directions. In the southwestern part of the system, faults are much more important than at the north, and great fault scarps are common.

**Minerals and Mining.**— The Rocky Mountain section is the great treasure region of North America. Almost all the precious and useful minerals are found here in abundance. Gold had been discovered and used by the aborigines, and deserted mines have been found where mining had been carried on in a crude way as early as 1680. Gold exists in nearly all the ranges of the system. Gravel containing coarse gold is found from 20 to 60 and even 100 feet below the surface. Abandoned gold fields were worked over with great profit during the last decade of the 19th century, by using improved methods. There are rich deposits of silver, copper, iron, salt, coal, lead and in the southwestern part of the United States, petroleum and gas. The placer gold regions in Alaska, and the gold fields of the same territory, have been found thus far of great extent and value. The value of the fine building stone, the fire-clay, gypsum, all kinds of cement material, are rarely taken into consideration because overshadowed by the value of the gold, silver and copper. The gypsum beds in the northwestern part of Texas and along the foothills of the ranges in southern Colorado are of great extent and value. For further details on minerals and mining see articles on the separate States of the United States in the Rocky Mountain region, also Canada and Mexico.

**Climate.**— The west slope of the Rocky Mountains, or all that portion which faces the Pacific Ocean, has a milder climate than the central or eastern part of North America in the same latitude. The warm winds from the Pacific Ocean bring heat and moisture. The rainfall is copious on the western side of the mountains. Like the mountain regions on all parts of the globe, the temperature lowers with increase of altitude, and the winds which here blow over the cold mountain tops and across the plateau region to the eastern slope carry with them neither heat nor moisture. In the southeastern part of this vast region where the mountains become low ranges or foot-hills, in the United States, west of the ranges that parallel the coast, the climate is hot in summer and mild in winter; in the Great Basin region and on the eastern slope of the mountains, extending out on the Great Plains, the climate is marked by aridity. See United States.

**Flora.**— The great aridity of the region east of the western or coast barrier prevents the growth of vegetation. The surface is exposed to erosive action which is especially rapid at such great elevations, and the denudation becomes more complete as the sand and small disintegrated fragments are swept away by the winds, thus giving no opportunity for the accumulation of soil. A large portion of the central and eastern mountain region and the western part of the Great Plains require irrigation in order to have vegetation; this is so even in the parts where there is abundant fertile soil. The arid portion of the United States, exclusive of Alaska, is about two-fifths of the whole area. The redemption of the arid lands is one of the nation's problems. Less than 10 per cent of the mountain region is forest-clad; but a larger proportion is covered with verdure, including the portions covered with dwarfed herbage, sage brush and stunted cedars and pines, most of which is useful for fuel but not for building purposes. Crops that mature in a short season and pasturage grasses are found on the foot-hills and valleys, especially along the streams. In some places where a little moisture is carried over the passes, below the snow line, the mountains are covered with the dark evergreen growth of hemlock, spruce, balsam, fir and tall pines, and still further down are interspersed among them the birch, beech, cherry and various other trees, while along the streams are found groves of cottonwood and willow. Over large districts, however, the forest growth is often exceedingly sparse, and even the grass that covers the plains, and upon which travelers depend for the sustenance for their animals, is parched and disappears in the long droughts to which these regions so remote from the sea are subject. In the sandy regions along the North Fork of the Platte River above Laramie River an extraordinary growth of artemisias and other odoriferous plants is found. They abound in the river bottoms and on the hills, growing to the height of two and three feet in tough, twisted, wiry clumps. A multitude of flowering plants abound in this region, among which prevail several of helianthus sunflower), and in the month of September, when they are mostly in bloom, the whole country resembles a vast garden. On the western slope may be found some of the largest trees in the world, many of them over 2,000 years old. The vast forests of the Northwest yield enormous quantities of timber. Not only is there a great variety and amount of plant life, but the vegetation attains a remarkable size. The shrub of the Atlantic region becomes a tall tree on the Pacific Slope. Like the mountains themselves, the vegetation which covers the western slope is large, massive, dense and in every way seems patterned on a gigantic scale.

**Fauna.**— For several generations the Rocky Mountains have been the world's «sportmen's paradise,» vying with India and central Africa. The hunters of big game found great attractions in its grizzlies, buffalo (bison), moose, caribou, not to mention its bighorns and Rocky Mountain goats. Its buffaloes and its beavers have become extinct through excessive depredations and, as early as 1905, James Outram wrote: «The Canadian Rocky Mountains are not remarkable for a great profusion of animal life, though big game in abundance will reward the skillful hunter, provided he is accompanied by a guide who is acquainted with the habitats of the noble denizens of these grand mountain haunts. But unless hunting or research into their ways is the specific object . . . few animals are likely to be seen. They are too shy and wary . . . to allow human beings to get very close.» He tells us that mule-deer caribou are found in the valleys and on the slopes, and fur animals are fairly plentiful; bear «in considerable quantities.»

One of the most interesting and unique of the fauna of this great mountain range is the Rocky Mountain goat, or white goat (*Oreamnus montanus*), of the family Bovidæ. Its white color (tinged with yellow) is its distinction, being like no other ruminant (except Alaskan wild sheep), remaining entirely white the year round. Its hair is long and pendent in winter, becoming comparatively short in summer; muzzle is hairy, tail short. Its rather short black horns are ringed in basal portion and they taper sharply. A strange huge hump is on the withers where it attains a height of three feet. While at a height of from 2,000 to 5,000 feet above sea-level the region is very arid and affords chiefly desert and alpine forms and the different zones otherwise have their characteristic species. These ranges of habitat are not sufficiently defined to permit their special allocations here.

**Mammalia.**— Greatest and most formidable of the ferocious beasts of the Rockies is the grizzly bear (*Ursus horribilis*), but indigenous also are the «silvertip,» the black bear (*Ursus americanus*), the brown and the cinnamon. Here are the prong-horned antelope (*Antilocapra*), the mountain goat (*Aplocerus*), the Rocky Mountain sheep or «bighorns» (*Ovis montana*) with their great spiral horns; they are the only American wild sheep. To the mammalia belong the lynx, coyote, wolverine, muskrat and marten, the porcupine, red-squirrel with bushy tail and bright striped coat, the gopher. The «whistling» marmot (*Arctomys*) and the prairie-dog (*Cynomys*), a rodent, make themselves audible here and the pikas or «calling» hares (*Lagomys princeps*). Other rodents are the lemming mouse (*Synaptomys cooperi*) and the jumping mouse (*Zapus hudsonius*). Better known to the public are the raccoon (*Procyon*), flying squirrel (*Sciuropterus*), ground squirrel (*Tamias*). The pouched marmot (*Spermophilus*) and the glutton (*Gulo*) are found here.

**Birds.**— There are many migratory birds, but of those resident there are a dipper (*Sinclus*); *Salpinctus*, one of the wrens; *Poospisa*, *Calamospiza*, genera of finches, including the grosbeak; Rocky Mountain thrush, *Hylocichla guttata audoboni; Piccicorvus* and *Gymnokitta*, genera of the crow family; *Centrocercus* and *Pediocœtes*, genera of the grouse (the grouse are locally termed «fool-hens»); blue-bird *Sialis-arctica;* creeper, *Certhia montana*, downy woodchuck, *Dryobates pubesectis;* garrot, *Clangula islantica;* hairy woodpecker, *Dryobates monticola;* jay, *Cyanocitta canadensis*, locally termed «whiskey John» or «whiskey Jack» from the Indian word *ouis-cachon;* pine grosbeak or pine bullfinch, *Pina enucleator montana;* the screech-owl, *Megascops americana maxwelliæ*. Of winter immigrants from the north are *Leucosticte* and *Plectrophanes*, genera of finches; *Perisoreus*, genus of crow family; *Picoides*, arctic woodpecker; *Lagopus leucurus*, or white-tailed ptarmigan. Summer migrants are *Oreoscoptes*, genus of thrushes; *Campylorhynchus* and *Catherpes*, wrens; *Paroides*, one of the tits; *Phœnopepla*, allied to the waxwing; *Embernagra* and *Spermophila*, genera of finches; *Pyrocephalus*, one of the tyrant shrikes; *Callipepla* and *Cyrtonyx*, American partridges; also *Harporhynchus*, *Lophophanes*, *Carpodacus*, *Spizella.* Two kinds of humming birds occur: the *Atthis* and *Selasphorus.*

**Reptiles, Amphibia and Fishes.**— A number of snakes and lizards. Of lizards there are *Iguanidæ. Geckotidæ, Svincidæ* and *Zonuridæ.* Of snakes there are *Calamarildæ, Calubridæ* and *Crotalidæ.* Among amphibia are *Siredon* (salamander); one of the *Proteidæ* is peculiar. Abundance of fish is found in the glacial streams and lakes, largely rainbow trout (*Salmo purpuratus*) weighing as high as six pounds and fine eating.

**History.**— The natural history of a region is told by the geology and physical geography. This region is not as old as the Appalachian. The form of the peaks and the irregular surface of the slopes differ. The missionary explorers visited the mountainous sections of Mexico and the southwestern part of the United States in the 17th century, but the ‘Relations of the Franciscans’ have as yet (1904) been only partially translated. A large part of our knowledge of this section came first from the reports of the government explorations made by Lewis and Clark in 1804. Other explorations were made by Harmann, Long, Schoolcraft, Bonneville, Nicollet, and Frémont (q.v.). Since 1844 more than 20 expeditions have been engaged in exploring these wild regions, nearly all of them for the United States government. Since the bill and appropriations of March 1853 the object of most of them has been the determination of the most practicable route for a railroad from the valley of the Mississippi to the Pacific. The history of the railroads across these mountains is largely a history of this region. The story of the strange, weird people called Cliff Dwellers (q.v.) is a most interesting chapter in the history of the efforts of man to use this region for a home. At present the population of this whole section is small. A large portion has less than two inhabitants to the square mile. About one-tenth of the whole Rocky Mountain area in the United States has from two to six inhabitants to the square mile; in some places in California, Oregon and Washington there are from six to eight; near the cities from 18 to 45, and in the San Francisco section from 45 to 90.

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**ROCOCO,** rō-kō′kō, or **ROCAILLE,** rō-kăl-ē′, in architecture a name given to the debased style of decoration which succeeded the first revival of Italian architecture. The ornamentation consists of panels with their moldings broken or curved at the angles and filled with rock-work, leafage, shell-work, musical instruments, marks, etc. This style prevailed in Germany and Belgium during the 18th century and in France from the time of Henry IV to the Revolution. In departing from simplicity the true principles of decoration were violated, hence the bizarre character of this decoration soon failed to please.

**ROD,** rōd, **Edouard,** Swiss author: b. Nyon, Canton Vaud, 31 March 1857; d. 29 Jan. 1910. He studied at Lausanne and Berlin, became editor of the *Revue Contemporaine* at Paris, succeeded Monnier in the chair of comparative literature at Geneva, but subsequently returned to Paris and became a collaborator on the *Correspondent,* the *Revue des Deux Mondes* and other periodicals. Among his works are ‘La course à la morte’ (1886); ‘Les trois cœurs’ (1890); ‘Le silence’ (1894); ‘Scenes de la vie suisse’ (1896); ‘Au milieu du chemin’ (1900); ‘Dante’ (1891); ‘Stendhal’ (1892), and ‘Essais sur Goethe’ (1898). Rod has visited the United States as lecturer before the Cercle Français de l'Harvard. Consult Stephens, W., ‘French Novelists of To-day’ (1914).

**ROD,** called also a pole, or perch, a measure of length, equivalent to five and one-half yards or 16½ feet. See Perch; Weights and Measures.

**RODBERTUS, Johann Karl,** yō′hăn kärl rŏd-bĕr′toos, German political economist: b. Griefswald, 12 Aug. 1805; d. Jagetzow, 6 Dec. 1875. In 1829–32 he was in the Prussian civil service. In 1848 he entered his brief political career as a member of the Prussian National Assembly. Then he was for a fortnight Minister of Education, and in January 1849 entered the second chamber from Berlin. Rodbertus was the real founder of scientific socialism in Germany. In contradistinction to Marx (q.v.), above whom he is placed by many modern economists, he was not international nor material in his views, but a nationalist and idealist, and expected social questions to be solved by legal methods. Professor Wagner has called him “the most distinguished theorist of the purely economic side of scientific socialism.” He wrote several works in connection with his propaganda. Consult the lives by Dietzel (1886–87) and Jentsch (1899).

**RODD,** Sir **Rennell,** English diplomat, author and poet: b. 1858. As consul-general at Zanzibar in 1897 during the insurrection he took an active part in the fighting. In 1897, as Lord Cromer's lieutenant, he headed a mission to the Emperor Menelik of Abyssinia and later was appointed Minister to Sweden. In 1908 he was sent as British Ambassador to Rome. He accompanied Lord Milner's mission to Egypt in 1920. Among his writings are a ‘Life’ of Sir Walter Raleigh and a book upon the ancient crusading princes of Achaia in Greece

**RODDICK,** Sir **Thomas George,** Canadian physician: b. 31 July 1846. He was educated at McGill University, engaged in practice at Montreal and became surgeon at the General Hospital there in 1874. He was consulting surgeon to the Royal Victoria Hospital and a governor of McGill University, where he was connected with the faculty from 1872, and filled the chair of surgery in 1890–1907. He was dean of the faculty in 1901–08. He served in the Fenian Raid in 1870 and in the North West Rebellion of 1885 he organized and was in charge of the medical field forces. He was a member of the Canadian Parliament in 1896–1904, and was knighted in 1914.

**RODENBERG,** rō'dĕn-bĕrg, **Julius,** German poet: b. Rodenberg, Hesse-Nassau, 26 June 1831; d. 1914. Of a Jewish family of the name of Levy, he adopted the name of his birthplace for his own. He was educated at the universities of Heidelberg, Göttingen and Berlin, afterward devoting himself to literature and traveling, and for many years after 1874 was editor of the *Deutsche Rundschau.* His publications include ‹Journalistic Life in London› (1859); ‹Pictures of Berlin Life› (1885–88); fiction, ‹The New Deluge› (1865); ‹The Grandidier› (1878), etc.

**RODENBOUGH,** ro'dĕn-bow, **Theophilus Francis,** American army officer: b. Easton, Pa., 5 Nov. 1838; d. 19 Dec. 1912. He was educated at Lafayette College, and in 1861 was appointed second lieutenant in the United States army. In the Peninsular campaign of 1862 he was captured at Manassas, but was soon exchanged, and at the battle of Gettysburg was in command of a regiment. He was engaged at Winchester, losing an arm in that battle, and was brevetted major for his bravery. In 1865 he was brevetted brigadier-general of volunteers, mustered out of the volunteer service and was appointed major in the regular army. In 1870 he was retired with full rank as colonel. He was secretary of the Military Service Institution in 1879, its vice-president in 1890–91, assistant inspector-general of New York in 1880–83, and in 1890–1901 chief of the bureau of elections in New York. He has written ‹From Everglade to Cañon with the Second Dragoons› (1875); ‹Afghanistan and the Anglo-Russian Dispute› (1886); ‹Uncle Sam's Medal of Honor› (1887); ‹Sabre and Bayonet› (1897). He was editor of ‹The Army of the United States› (1896); ‹Journal of the Military Service Institution› (1899).

**RODENTIA,** or **GLIRES,** an extensive order of Mammalia, represented by such forms as mice, beavers, porcupines, squirrels, rabbits, lemmings, etc. Of the characteristics tooth structures are the most important. The canines are always absent and the incisors large and chisel-like and, with the exception of the *Leporidæ,* which have four in the upper jaw, never more than a single pair in each jaw. These teeth consist each of a front layer of hard enamel and a posterior part of softer dentine, which ensures a persistent sharp edge, since the more rapid wearing of the softer dentine leaves the harder enamel of the front surface as a chisel-like edge. These teeth continue to grow from persistent pulps throughout life. The incisors are long and curved and each forms a segment of a circle. Between the incisors and the molar teeth a wide interval exists. The molars are few and their crowns may exhibit a variously laminated or tuberculate pattern. This structure of the molars has relation to the motion of the jaws in gnawing, the jaws being so articulated by narrow condyles fitting in longitudinal grooves that they slide backward and forward instead of moving vertically, as in most other animals. The transverse ridges of the molar teeth act, therefore, in opposition to this sliding motion of the jaws. The molars in some cases (as in the beavers) also grow from persistent pulps and possess undivided fangs. There is always a succession of milk and permanent dentitions. The chief chewing muscle is the masseter, which is greatly developed, while the temporal muscle is small. The usual number of toes is five on both feet, but the pollex may be rudimentary or absent, and in the hind feet the number may be reduced to four, as in the hares, or to three, as in the agouti, jerboa, etc. Generally they are all clawed, but sometimes, as in the capybara, have hoof-like terminations. The scapula is narrow and remarkable for the long acromion process, and the clavicles are generally well developed, but may be imperfect or absent, as in the hares and guinea-pig. The femur generally possesses a third trochanter, and the tibia and fibula are distinct or, as in the rats and hares, united. The beaver has the hind feet webbed, to adapt it for its semi-aquatic life. Some rodents have the hind legs of extreme length, as the jerboas. Usually a more or less complete hairy screen extends across the mouth at the narrow region of the palate behind the incisor teeth, thus preventing the entrance into the hinder portion of the mouth of the chips or dust that result from gnawing operations. Many rodents are provided with cheek-pouches for carrying food; usually these open within the mouth, but in the *Geomyidæ* they open externally.

The stomach, generally a simple structure, may in some forms, as the lemmings, become quite complex, and its anterior portion, as in beavers, may be provided with glandular appendages. This same portion in the dormouse is glandular and dilated so as to resemble the proventriculus or digestive stomach of birds. A large sacculated cæcum generally exists, and the intestine is usually very long. A gall-bladder is sometimes wanting. The surfaces of the cerebral hemispheres are smooth or destitute of convolutions and, when viewed from above, the cerebellum is seen to be in great part uncovered by the cerebrum. The corpus callosum is well developed. The penis is usually retractile and contains a bone, and the testes normally remain in the abdomen, but descend periodically into the groin at the breeding seasons. The uterus is frequently completely divided into two cornua or horns, each of which opens separately into the vagina. In others the two cornua unite to form a single uterus or womb. The placenta is of the deciduate type and of discoid form. Rodents are extremely prolific. Most species of rodents have characteristic and penetrating odors which arise from scent glands variously located in the vicinity of the anus. The skin, generally covered with hair, is spiny in the porcupines (q.v.), some genera of which group possess prehensile tails. Many of these animals furnish furs of value in commerce.

**Extent and Classification.**— This is by far the largest order of mammals, comprising more than 2,000 species. Rodents are found in all parts of the world, but are poorly represented in the Australian region and on Madagascar and are altogether absent from certain oceanic islands. In South America they reach their maximum development. With a very few exceptions, such as the house-rats and the muskrat, they are exclusively herbivorous, and different species subsist upon grains, nuts, barks, roots, herbage, etc. Notwithstanding their great structural similarity the rodents have fitted themselves to the most varied environmental conditions and present many remarkable adaptations and interesting habits. Most of them are terrestrial; many, like the mole-rats, rabbits and prairie marmots, are burrowers: some, as the beaver and muskrat, are aquatic; many squirrels and others are arboreal. They run, leap, climb or, like the flying squirrel and *Anomalurus,* sail through the air on skinny parachutes. Some, as the woodchuck, are solitary; many are gregarious, like the rats and mice, colonial like the rabbit and prairie marmot, or even, like the beaver, form co-operative societies and exhibit wonderful building instincts. Migratory movements of large parties of rodents are not infrequent, the most remarkable of which are the well-known migrations of the lemmings. Although generally of small size, the rodents have gained a dominance both of species and individuals through their great fecundity and their ability to gnaw out a living beyond the reach of most animals. Their wariness and secretiveness have aided no little toward their preservation. though they form the chief subsistence of a host of snakes, birds of prey and small carnivorous mammals. Human interests are affected by these animals in a variety of ways. Some of them furnish food, furs or sport, others are interesting pets, but the great majority are injurious to agricultural interests. No less than 400 species and many additional sub-species have been described as occurring within the limits of North America, the great majority being mice.

The following is a modern classification of the order, through some mammalogists recognize a larger number of families:

**Group Simplicidentata.**— There is a single pair of upper incisors with the enamel layer confined to the anterior surface; the fibula does not articulate with the calcaneum. Three sub-orders:

I. *Hystricomorpha,* or porcupine-like rodents: tibia and fibula distinct, alveolus of lower incisor ending on the medial side of the ramus of the lower jaw, only one premolar in each jaw: Families: *Octodontidæ,* containing the coypu and many others chiefly of South America, but a few in Africa; *Hystricidæ,* the porcupines; *Chinchillidæ,* chinchillas of South America; *Dasyproctidæ,* agoutis, etc., of South America; *Dinomyidæ,* containing a single generalized rodent of Peru; *Caviidæ,* the cavies or guinea-pigs and capybara of South America.

II. *Sciuromorpha,* or squirrel-like rodents: tibia and fibula distinct from each other, the alveolus of the lower incisor penetrating the ramus of the lower jaw and the premolars one or two on each side above and one on each side below. Families: *Sciuridæ,* the squirrels and marmots, found throughout the world except Australia; *Anomaluridæ,* peculiar squirrel-like animals with extensive parachutes along the side found in tropical Africa; *Haplodontidæ,* the sewellel or mountain-beaver of the mountains of the north Pacific coast; *Castoridæ,* the beavers of the northern hemisphere.

III. *Myomorphia,* or rat-like rodents: tibia and fibula coalesced, lower incisors as in the squirrels, premolar $\frac{0}{0}$ to $\frac{1}{1}$. Families: *Dipodidæ,* jumping mice, jerboas, etc. North America, Europe, Asia and Africa; *Muridæ,* the rats and mice, a very extensive and cosmopolitan group, variously subdivided; *Myoxidæ,* the dormice of Europe and other Old World forms; *Geomyidæ,* pouched gophers and pouched mice of America; *Lophiomyidæ,* a remarkable arboreal African form; *Spalacidæ,* the mole rats and their allies of the Old World.

**Group Duplicidentata.**— Besides the large incisors, the enamel covering of which extends all around, there is a second pair in the upper jaw; the fibula articulates, with the calcaneum and the ankle and elbow joints are tongued and grooved; tibia and fibula co-ossified. One suborder: *Lagomorpha,* hare-like rodents, with two families: *Leporidæ,* hares and rabbits, cosmopolitan; *Lagomyidæ,* picas or whistling hares, North America and Europe.

**Fossil Rodentia.**— Rodent remains first occur in a fossil state in the Eocene Period, in which remains of forms allied to the dormice, porcupine and squirrels exist. In Pliocene and post-Pliocene formations they become tolerably plentiful. Of the post-Tertiary forms, *Trogontherium,* or the great beaver, found in European deposits, is a familiar species, and the cave beaver (*Castor spelæus*) is also a notable form. *Trogontherium* may possibly have survived the human period. The hares and rabbits first occur as fossils in Lower Miocene of North America and Pliocene of Europe, and the rats and mice are found in Eocene, Miocene and Pliocene formations. The guinea-pigs are chiefly Pleistocene, their remains occurring in the Brazilian bone caves of that age. Some of the extinct rodents were as large as an ox. Very little light has been thrown on the origin of the order by a study of the fossil forms, though Professor Cope believed the Tillodonta to be their ancestors.

**Bibliography.**— Consult the articles in this work on the various animals included in the order, and the following: Coues and Allen, 'Monographs of North American Rodentia,' United States Geological Survey of Territories (Washington 1877); Elliot, 'Synopsis of the Mammals of North America,' Field Columbian Museum (Chicago 1901); Beddard, 'Mammals' (London 1902); Alton, 'On the Classification of the Order Glires,' Proc. Zoological Society (London 1876); Osborn, 'Age of Mammals' (New York 1910); and numerous papers by Merriam, Miller, Palmer and others in the 'Bulletins' of the Biological Survey of the United States Department of Agriculture.

**RODERICK,** rŏd'ẽr-ĭk (Spanish, RODRIGO), last king of the West Goths in Spain. In 710 he was chosen king. Shortly after the Moors, under Muza, invaded Spain. Roderick met the invaders on the banks of the Guadelete in 711, but was defeated, and perished in the battle. Some accounts declare that he maintained resistance for two years longer. He is the hero of Scott's 'Vision of Don Roderick' (1811) and Southey's ‹Roderick the Goth› (1814). Consult Toilhan, ‹Chronique Rimée des Derniers Rois de Tolède› (1885); Dozy, ‹Geschichte der Mauren in Spanien› (1874); Saavedra, ‹Estudio sobre la invasion de los Arabes› (1895).

**RODES, Robert Emmett,** American Confederate soldier: b. Lynchburg, Va., 29 March 1829; d. 19 Sept. 1864, in the battle of Opequon (q.v.). He studied at the Virginia Military Institute, where he graduated in 1848 and remained as professor till 1861, when he was commissioned as captain of the Mobile Cadets. In the early stage of the Civil War, he commanded the 5th Alabama Infantry, Ewell's 2d brigade, Army of the Potomac, in the first battle of Bull Run (q.v.). He was severely wounded at Seven Pines and later distinguished himself at Gaines' Mill and South Mountain in 1862. His brigade was in the van at Chancellorsville and for his services he was promoted to major-general on the field. He took part in numerous battles — notably that of the Wilderness (q.v.) — and was one of the most successful of the Southern military leaders.

**RODGERS,** rŏj'ėrz, **Christopher Raymond Perry,** American naval officer: b. Brooklyn, N. Y., 14 Nov. 1819; d. Washington, D. C., 8 Jan. 1892. He entered the United States navy as a midshipman in 1833, commanded the schooner *Phœnix* in the Seminole War in 1840–41, was engaged in blockading service in the Mexican War and served in the trenches at Vera Cruz and at the capture of Tobasco and Tuspan. He was commissioned commander in 1861, was fleet-captain at the battle of Port Royal and also in the attack on the defenses of Charleston in 1863. He was then appointed to command the steam sloop *Iroquois* and was engaged in special service until the close of the war. He became commodore in 1870 and in 1874 received rank as rear-admiral. He was superintendent of the Naval Academy in 1874–77, in command of the naval forces in the Pacifis in 1878–80, and from then until his retirement in 1881 was again superintendent at the academy. He presided over the convention held in Washington in 1885 for fixing a prime meridian and universal day.

**RODGERS, Frederick,** American admiral: b. Havre de Grace, Md., 3 Oct. 1842; d. 3 Nov. 1917. He was graduated at the United States Naval Academy in 1861. He participated in the actions at Donaldsonville, Port Hudson and College Point; and served on the Grand Gulf, Atlantic and West Gulf blockading squadrons in 1863–65. He was promoted lieutenant-commander in 1866 and commander in 1875. He was lighthouse inspector in 1876–77, 1881–83 and 1887–90, and was promoted captain in 1890. He was supervisor of New York Harbor in 1892–93; commander of the United States ship *Massachusetts* in 1896–97; commanded United States ship *Puritan* during the war with Spain, and became commodore in December 1898. He was president of the Board of Instruction and Survey in 1898–1901, being promoted rear-admiral in 1899. In 1901 he was senior squadron commander of the Asiatic fleet, and in 1902 he was commander-in-chief. He was commander of the navy yard, New York, in 1903–04; and was retired 3 Oct. 1904. He served on special board duty in 1904–07.

**RODGERS, John,** American naval officer: b. Harford County, Md., 11 July 1771; d. Philadelphia, 1 Aug. 1838. He entered the naval service in 1789, and in 1798, as lieutenant and executive officer of the frigate *Constellation,* captured a French vessel, for which service he was promoted captain in 1799. In 1802 he was appointed to the Mediterranean squadron then engaged in the war with Tripoli, in the success of which he was largely instrumental. He succeeded Commodore Barron in the command of the squadron in 1805, and in this office rendered a valuable diplomatic service in securing treaties from Tripoli and Tunis which established the friendly relations since existing between those countries and the United States. In 1812 Commodore Rodgers, in command of the Atlantic squadron, was the first to fire upon the British. and during the campaign captured some 23 English vessels. He was president of the Board of Naval Commissioners 1815–37, except during the three years 1824–27, when he was again in command of the Mediterranean squadron.

**RODGERS, John,** American naval officer, son of the preceding: b. Harford County, Md., 8 Aug. 1812; d. Washington, D. C., 5 May 1882. He was commissioned lieutenant in 1840 and was engaged in the hostilities with the Seminoles from 1840 to 1843. Subsequently he performed a valuable service in surveying the Florida coast. His explorations from 1852 to 1861 in the north Pacific and China seas and in the Arctic Ocean were also of much scientific and commercial importance. As commander of the monitors *Weehawken, Dictator* and *Monadnock* he took a prominent part in the Civil War. He was made commodore in 1863, and in 1869 commissioned rear-admiral in command of the Asiatic fleet. In this office he rendered valuable service as a diplomat by establishing the safety of American commerce in Korea. At his death he was superintendent of the naval observatory at Washington.

**RODIN,** rō-dăṅ, **(François) Auguste,** eminent French sculptor: b. Paris, November 1840; d. 17 Nov. 1917. After working in a subordinate position in several studios he exhibited for the first time in the Salon in 1875, and since then became well known as a sculptor utterly beyond the control of classical convention, and reveling in the first expression of emotion and action, yet showing a power of execution worthy of the best Renaissance art. One of his first productions was ‹The Broken Nose,› which invited much discussion. In 1870, during the siege of Paris, he served in the national guard. He has done some remarkable work, as for instance ‹The Brazen Age,› exhibited as a cast, and after much discussion executed in bronze for the Luxembourg Gardens. Among other rugged and fantastic creations are ‹Burghers of Calais›; ‹The Kiss.› He has made busts of Bastien-Lepage, Victor Hugo, Henri Rochefort and Jules Daloux, the sculptor. ‹The Hand of God,› ‹The Bather,› a bust of ‹Saint John,› and 18 minor works, are in the Metropolitan Museum of New York. Originals or copies of his works are to be found in all the great sculpture collections of the globe. Rodin was distinctly an impressionist, seeking to convey a psychological meaning to the beholder. He was not satisfied to reproduce a figure; he felt it necessary to present an idea with every piece of carving. He not only conquered the prejudice of convention, which demanded only the beautiful and graceful, according to accepted types, but he set a new standard of modern expression, emphasizing the strength and character even of ugliness, and showing the possibility of emphasizing an idea in stone by exaggeration, as is done by the most expert cartoonist. It was not humor, however, that he strove to display, but rather the grand human emotions. The breadth of Rodin's character is illustrated by his indifference to hostile criticism. No other sculptor of modern times has received so much criticism, nor succeeded in overcoming all criticism. His plaster sketch of Balzac, in a voluminous dressing gown, was declared absurd by the committee of the Society of Men of Letters, and they refused to accept it, giving the order to Falguiére. In the salon where his successful opponent exhibited his Balzac, Rodin entered a bronze bust of Falguiére, showing that he was above all petty jealousy. Time has shown that he could afford to be, and many devotees of art now declare that he never had a peer. This is doubtless over-enthusiasm. Rodin was a great inspired sculptor, ranking with three or four of the world's best, and he has given birth to a new school. He has been showered with honors, college degrees, official positions in art societies, and was chosen president of the International Society of Sculptors, Painters and Engravers, succeeding Whistler in 1904. At the 1900 Exposition in Paris an entire building was given up to the display of Rodin's works. In addition to his marble and bronze figures were many water-color drawings and etchings. Further illustrating the versatility of his genius are a number of writings on various subjects, of which the most notable is ‹Les cathedrales de France› (1914). Consult Marx, ‹Auguste Rodin, Ceramiste› (Paris 1907); Lawton, F., ‹Life and Work of Auguste Rodin› (New York 1907); Dirks, R., ‹Auguste Rodin› (Paris 1913); Bulletin, Metropolitan Museum of Art, *Supplement* (New York, May 1912); Harris, F., ‹Contemporary Portraits› (New York 1915).

**RODMAN, Hugh,** American naval officer: b. Frankfort, Ky., 6 Jan. 1859. In 1880 he was graduated at the Naval Academy of the United States and at the Naval War College in 1907. In 1883 he was promoted ensign, junior grade; became ensign in the following year and was made lieutenant, junior grade, in 1893. In 1903 he was commissioned lieutenant-commander; commander in 1907; captain in 1911, and rear-admiral on 23 May 1917. In the Spanish-American War he served on the *Raleigh;* was executive officer of the *New Orleans* in 1904; on the *Cincinnati* in 1904–05; the *Wisconsin* 1905, etc. In 1907–08 Rodman was inspector in charge of the sixth lighthouse district; commanded the *Cleveland* in 1909–10; served as inspection officer at the Mare Island navy yard 1910–11; commander of the *Connecticut* in 1912; the *Delaware* in 1912–13, and in 1914–15 was superintendent of transportation of the Panama Canal. In 1915–16 he commanded the *New York* and the following year served as member of the General Board of the Navy Department. In 1917 Rodman was made commander of Division Three of the Atlantic Fleet and later in the same year became commander of squadron I of the Battleship Force of the Atlantic Fleet; subsequently he commanded Division Three of Battleship Force One of the same fleet and in November 1917 was made commander of Division Nine of the Battleship Force for duty with the British Grand Fleet. In April 1918 Rear-admiral Rodman was made commander of the battleship divisions of the navy. He was awarded medals for his part in the battle of Manila Bay, 1 May 1898, and also for his efficiency in other actions during the Spanish-American War.

**RODMAN, Isaac Peace,** American soldier: b. South Kingston, R. I., 18 Aug. 1822; d. Sharpsburg, Md., 30 Sept. 1862. He engaged in business as a woolen manufacturer, served several terms in the Rhode Island legislature and in 1861 resigned his seat in the State senate, organized a company, of which he was commissioned captain, and went to the front. He was promoted lieutenant-colonel for gallantry at the first battle of Bull Run, fought at Roanoke Island and at New Berne, N. C., and in 1862 was commissioned brigadier-general of volunteers. He commanded a division at Antietam in 1862 and while leading a charge was mortally wounded.

**RODMAN, Thomas Jefferson,** American military officer: b. Salem, Ind., 30 July 1815; d. 7 June 1871. He was graduated from the ordnance department of West Point in 1841 and was appointed to service at various arsenals, where his experiments in the manufacture of guns soon brought him into prominece. His method of casting guns on a hollow core, the metal being cooled by a stream of water running through the inside, was adopted in 1847. This method he later applied to shells and cannon. In 1860 he completed his experiments upon a 15-inch gun for the uses of mammoth powder, the cannon which bears his name. The Rodman gun and mammoth powder were adopted by the United States government in the following year, and soon after by Russia, England and Prussia. In 1865 he was brevetted brigadier-general, and four years before his death promoted to the rank of lieutenant-colonel.

**RODMAN, William Lewis,** American surgeon: b. Frankfort, Ky., 7 Sept. 1858; d. 8 March 1918. He was graduated at the Kentucky Military Institute in 1875 and took his M.D. at Jefferson Medical College, Philadelphia, in 1879. He was a surgeon in the United States army in 1880–82; then engaged in practice at Louisville, Ky., where he was demonstrator of surgery in the medical department of the University of Louisville in 1885–93. He was professor of surgery at the Kentucky School of Medicine in 1893–98; and thereafter held the chair of surgery at the Medico-Chirurgical College of Pennsylvania, and was also professor of surgery and clinical surgeon of the Women's Medical College of Pennsylvania from 1900. He wrote ‹Diseases of the Breast› (1908).

**RODMAN GUN.** See GUNS, HISTORY AND DEVELOPMENT.

**RODNEY**, rŏd'nĭ, **Cæsar**, American patriot: b. Dover, Del., 7 Oct. 1728; d. there, 29 June 1784. He was the grandson of William Rodney, a large landholder under the Duke of York, in the grant to William Penn, and member of Penn's council. As high sheriff of Kent County and judge of all the lower courts of the province of Delaware, Cæsar Rodney came into prominence as a statesman. He was a delegate to the Stamp Act Congress held in New York in 1765, and as speaker of that body was largely instrumental in bringing about the first Continental Congress, of which he was also a member. In this capacity he was one of the signers of the Declaration of Independence. In 1775, after the second session of the Congress at Philadelphia, he journeyed through his native province sowing the seed of independence, and was appointed brigadier-general in the army under Washington at the beginning of the Revolution. As commander of the Delaware militia he rendered valuable service, for which he was made a major-general in 1777. In this year also he was made president of the State of Delaware, from which office he retired in 1782.

**RODNEY, Cæsar Augustus**, American statesman, son of Cæsar Rodney (q.v.): b. Dover, Del., 4 Jan. 1772; d. Buenos Aires, Argentina, 10 June 1824. He was graduated from the University of Pennsylvania in 1789 and after his admission to the bar in 1793 practised law in Wilmington, Del. On account of his election to Congress as an anti-Federalist in 1805 he has been called the first Democrat in that body. In 1807 he was appointed Attorney-General of the United States by President Jefferson, but resigned this office in 1811, and in the War of 1812 took active part on the Canadian frontier as captain of artillery. In 1821 he again represented Delaware in Congress, and in the following year took his seat in the United States Senate. In 1823 he was appointed Minister Plenipotentiary to the Argentine provinces.

**RODNEY, George Brydges**, 1st Baron Rodney, English naval commander: b. Walton-upon-Thames, and baptized 13 Feb. 1718; d. London, 23 May 1792. He became a lieutenant in 1739, first obtained a ship in 1742 and in 1748 went to Newfoundland as governor. On his return in 1751 he was elected member of Parliament. In 1759 he was promoted rear-admiral, and in 1761 sailed to the West Indies, reduced Martinique and took possession of Saint Lucia, Grenada and Saint Vincent. In 1762 he became vice-admiral and in 1764 was made a baronet. The next year he became governor of Greenwich Hospital. In 1779, having already been promoted to the rank of admiral, he was put in command of a fleet bound for the West Indies with instructions to relieve Gibraltar on his way. This latter was accomplished on 16 Jan. 1780 by capturing or destroying seven ships of the fleet of the Spanish admiral, Don Juan de Langara. Continuing on to the West Indies he encountered the French fleet under Guichen near Martinique, with indecisive results, though with considerable loss on both sides. In April 1782, he again met a French fleet in the West Indies, this time commanded by Count de Grasse; and after a three days' fight overcame the French, captured de Grasse and his flagship, the *Ville de Paris*, but forewent the larger part of his spoil by not giving chase. Before the news of the victory reached England, Admiral Hugh Pigot had been sent to supersede Rodney, and though he retired from active service, he was rewarded with a pension and a barony. Consult Mundy, ‹Life and Correspondence of Lord Rodney› (1830); Hannay, ‹Rodney› (‹English Men of Action›).

**RODRIGUEZ, José Ignacio**, Cuban-American lawyer and author: b. Havana, Cuba, 11 Nov. 1831; d. Washington, D. C., 1 Feb. 1907. He was educated at the University of Havana and studied American law under Caleb Cushing. In 1855 he was admitted to the bar at Havana and in the same year was appointed supernumerary professor of philosophy at the university there. In 1856 he became professor of natural philosophy and chemistry at the Preparatory Technical School of Havana; in 1863 professor of natural philosophy and chemistry, Havana Institute; in 1864 judge of the Belen district, and in 1866 inspector-general and member of the superior board of public instruction. In 1869 he removed to the United States and in 1890 was secretary to the International American Conference and in 1891 secretary to the International American Monetary Commission. At Paris in 1898 Dr. Rodríguez acted as private adviser in matters of Spanish law to the American Peace Commission. In 1902–03 he was secretary to the United States delegation to the Pan-American Conference at Mexico City. He was at one time chief translator and head of the Spanish department of the International Bureau of American Republics and at the time of his death was chief translator and librarian of the Columbus Memorial Library. He published ‹Vida de Don José de la Luz y Caballero› (1874); ‹Vida del Presbitero Don Felix Varela› (1878); ‹Estudio histórico sobre el origen, desenvolvimiento y manifestaciónes prácticas de la idea de la anexión de Cuba á los Estados Unidos de America› (1901), and contributions to the ‹Catholic Encyclopedia,› *The Forum*, *American Catholic Quarterly Review*, etc.

**RODRIGUEZ**, rod-rē'gĕs, a volcanic island in the Indian Ocean, 19° 41′ S. and 63° 23′ E., about 345 miles east by north of Mauritius (q.v.), of which it is a dependency, and connected by cable telegraph. It is 13 miles long by six miles wide, and the altitude is about 1,750 feet. It is surrounded by a coral reef. Its isolation has prevented change in its flora and fauna, and for this reason the island has been of interest to the botanist and the zoologist. It is very fertile and tropical fruits flourish, also sugar-cane, cotton, coffee and tobacco. The only indigenous animal is a fruit-eating cat, but deer and fowl were once abundant. Until near the end of the 17th century the dodo-like solitaire, now an extinct bird, was found on this island. The population is about 4,000, mostly negroid. The government maintains a hospital and school and retains a priest. The island was discovered by the Portuguese in 1645 and since 1810 it has been a British colonly. Consult ‹Reports› of the Transit of Venus Expedition in ‹Philosophical Transactions› (London 1879).

**RODRÍGUEZ Y FERNÁNDEZ, Teodoro**, Spanish educator and author: b. Santiago Millas, León, 8 Nov. 1864. He was educated at Astorga Seminary, the Augustinian scholasticate, Valladolid, College of La Vid, Burgos, Escorial University, Ximenes Institute and Central University, Madrid. In 1879 he entered the Augustinian order and was ordained to the priesthood in 1887. He was successively vice-rector, professor and rector of Escorial University and president of the Catholic Social Bureau of the Escorial. At present he is provincial of the Sacred Heart province of his order and moral instructor to Don Alfonso de Bourbon. In 1911 Dr. Rodríguez took an active part in the assembly which presented resolutions on the laws of education to the minister of public instruction. He founded the charitable Social Bureau of the Escorial, which maintains a night school for workmen, savings banks, loan offices, a department of domestic economy and fund for providing dowries. He has published ‘Elementos de física y química’; ‘Elementos de química’; ‘La enseñanza en España’; ‘Estudios sociales’ (2 vols.); ‘Lecturas sociales’; ‘Problemas cientifico-religiosos’; ‘La paz del alma’; ‘Ricos y pobres’; ‘Misión social de las classes cultas y acomodadas’; ‘El deber social’; ‘Sindicalismo y Cristianismo’; ‘La civilización moderna’; etc.

**RODRIGUEZ DE FONSECA, Juan.** See FONSECA, JUAN RODRIGUEZ.

**RODRÍGUEZ GALVÁN,** rōd-rē'gās gäl-văn', **Ignacio,** Mexican poet and dramatist: b. 1816; d. 1842. Although he died at the early age of 26 he had already proved himself one of the greatest dramatic and poetic geniuses of Mexico and one of the masters of the Spanish tongue. Early in the beginning of the last century Mariano Galván had a noted bookstore in Mexico City and he published the *Galvan Callender,* which is still issued. His young nephew Ignacio came to work for him. The boy had very little education; but he set to work to educate himself through the books in his uncle's store and with the help of kindly priests and other visitors to the old book shop. In this way he mastered several languages, while yet in his 'teens. But above all he studied poetry and more especially the works of the romantic poets who had already begun to make a stir in the world of literature. Young Rodríguez Galván early began to write in imitation of his favorite authors, poetry and drama. In 1838 when he was but 22 years of age, his first drama was produced in Mexico City with great success. This drama, "Muñoz, Visitador de Mexico,’ which was based on events in Mexican history of the colonial period, was the first real national drama in Mexico; and it set the fashion for others, many of them of notable worth. It is a tragedy in which all the principal characters suffer in the usual way of the romantic school. But it has many strong qualities which has ever made it a favorite in Mexico and in Spain, where it has been frequently produced. Rodríguez Galván's bent of mind was tragic and his odes and poems, though forceful and poetic, are all tinged with this tragic hue. The young poet also set the fashion of going into the pre-Conquest history of Mexico for subjects, in the ‘Visión de Moctezuma.’ This legend was written about a tradition of the unfortunate emperor of Mexico who occupied the throne of the Aztecs at the time of the Conquest. The poet also went back into the same period for the incidents in ‘La Profecía de Guatemoc,’ the last emperor of the Aztecs. In this poem he again sounds a very strongly national note, when he presents the dead emperor, in a vision, showing his burnt feet, as a token of the cruelty of the Spaniards who had tortured him in an effort to force him to reveal the hiding place of a royal treasure which he was supposed to have hidden. This latter poem was followed by a second drama dealing with an incident of the colonial period of Mexican history and entitled ‘El Privado del Virrey,’ which was still more popular than his first effort in this field; and awakened the people of the capital to the fact that in this young man had arisen a national drama and poetry. His literary reputation secured for Rodríguez Gaván an appointment in the Mexican diplomatic service in South America. At that time yellow fever was raging in Vera Cruz; Galván succumbed and died at Havana, on the threshold of what promised to be a much greater fame than he had as yet achieved. Young though he was at the time of his death his youthful accomplishments have won for him the title of father of the Mexican national drama and of Mexican romantic poetry of the purely national type. In reality he is the first of the romantic poets of Latin America and his work has had considerable influence upon that of other Latin-American poets in Central and South America.

**ROE, Charles Francis,** American soldier: b. New York, 1 May 1848; d. Highland Falls, N. Y., 1 Dec. 1922. He was graduated at West Point in 1868 and entered the 1st cavalry. In 1870 he was transferred to the 2d cavalry; became second lieutenant in 1871 and first lieutenant in 1880. In his early days in the West he rode 22½ hours from Camp Harney, Ore., to Fort Bidwell, Cal., to carry orders to prevent an Indian outbreak. In 1888 he resigned from the army and engaged in real estate business in New York. He became major of Troop A, New York Volunteer Cavalry, in 1895, and later was appointed major-general. President McKinley appointed him brigadier-general of United States volunteers in June 1898; he retired on account of his advanced age on 1 May 1912.

**ROE, Edward Payson,** American Presbyterian clergyman and novelist: b. Moodna, New Windsor, Orange County, N. Y., 7 March 1838; d. Cornwall, N. Y., 19 July 1888. He studied at Williams College and at Auburn and Union Theological seminaries; was ordained to the Presbyterian ministry; in 1862–65 was a chaplain in the volunteer service; and from 1865 until his resignation in 1874 held a Presbyterian pastorate at Highland Falls, N. Y. There his addresses on topics of the Civil War gained for him some notice as a speaker. In 1874 he removed to Cornwall-on-Hudson, N. Y., where he cultivated small fruits and turned out a series of novels which sold largely (759,000 copies, it was estimated, at his death) and met with widespread interest but lacked distinction or literary quality. Among the titles are ‘Barriers Burned Away’ (1872); ‘Opening a Chestnut Burr’ (1874); ‘A Knight of the 19th Century’ (1877); ‘A Face Illumined’ (1878); ‘Driven Back to Eden’ (1885); and ‘The Earth Trembled’ (1887). He published also three books on horticulture. Consult ‘E. P.

Roe: ‹Reminiscences of his Life,› by his sister, May Roe (1899).

**ROE, Francis Asbury,** American naval officer: b. Elmira, N. Y., 4 Oct. 1823; d. Washington, D. C., 28 Dec. 1901. He entered the naval service in 1841 as acting midshipman on the *John Adams* and received his later training at the Naval Academy at Annapolis and in service in various parts of the world. He was executive officer of the flagship *Vincennes* during the Arctic exploring expedition of 1855, and was made a lieutenant in that year. At the outbreak of the Civil War he was appointed executive officer of the *Pensacola,* which was in the van of Farragut's fleet, and was especially commended for bravery during the famous passage of Fort Jackson and Fort Saint Philip. In 1862 he was ordered to the gunboat *Katahdin* and upon the first day of his command fought the battle of Baton Rouge. For this service he was promoted to the rank of lieutenant-commander. On 5 May 1864, in command of the *Sassacus,* he defeated the Confederate ram *Albemarle* and the gunboat *Bombshell* near Plymouth, N, C. As commander of the Gulf Division of Rear-Admiral Palmer's squadron at Vera Cruz he rendered noteworthy service as negotiator between the forces of General Juarez and the governor of Vera Cruz, and received the surrender of that city in 1867. From 1869 to 1871 he was with the Asiatic fleet and was commissioned captain in 1872. In 1884 he was promoted rear-admiral and was retired the following year.

**ROE, John Orlando,** American laryngologist: b. Patchogue, L. I., 3 Feb. 1849; d. 24 Dec. 1915. He was graduated M.D. at the University of Michigan in 1870 and later studied at the College of Physicians and Surgeons, New York. He engaged in practice at Rochester, N. Y., and specialized in laryngology, rhinology and otology, in which fields he made extensive researches and originated several valuable operations. He wrote ‹Recurrent Papilloma of the Pharynx› in ‹Illustrated Medicine and Surgery› (1884); ‹Foreign Bodies in the Larynx and Trachea› and ‹Foreign Bodies in the Pharynx and Œsophagus› in ‹System of Diseases of the Ear, Nose and Throat› (1893); ‹Injuries and Deformities of the Nose and Throat› and ‹Operations in the Upper Air Passages› in ‹American Textbook of Diseases of the Eye, Ear and Throat› (1899), etc.

**ROE, Richard.** See Doe, John.

**ROE-DEER,** a small European deer (*Capreolus capræa*), the adult measuring about two feet at the shoulders and about two and one-half feet at the hind quarters. The buck's antlers are small, and provided with three short branches only. The general body-color is a brown. The tail has a white patch at its root and the chin, belly and inner aspects of the limbs are grayish-white. These animals inhabit mountainous districts, and are monogamous, each male remaining faithful throughout life to one female. The habits of the roe are somewhat like those of the goat, or even of the chamois. It keeps its footing on rocks with great security, bounds very actively, and takes great leaps. Its usual pace, when not very hard pressed, is, however, a kind of canter. It is not gregarious, not more than a buck and doe with one or two fawns being usually seen together. The voice of the roe-deer resembles that of a sheep, but is shorter and more barking. The roe browses on the tender shoots of trees and bushes as well as on herbage, and is thus very injurious to young woods. It is never very thoroughly tamed, and when kept in parks is apt to become mischievous, and the male dangerous. The venison is superior to that of the stag, but not equal to that of the fallow deer. The horns are used for handles of carving knives and similar articles.

**ROEBLING,** rĕb'ling, **John Augustus,** famous American bridge-builder: b. Mühlhausen, Prussia, 12 June 1806; d. Brooklyn, 22 July 1869. He was graduated at the Royal Polytechnic School in Berlin in 1826, his thesis being on suspension bridges. He came to America in 1831 and settled in Pittsburgh, Pa. Later he was engaged in surveying the lines of the Pennsylvania Railroad across the Allegheny Mountains from Harrisburg to Pittsburgh. Having spent some years thereafter in the manufacture of iron and steel wire he utilized his new product in 1844–45 in building an aqueduct across the Allegheny River at Pittsburgh, consisting of a wooden trunk supported by wire cables. The bridge comprised seven spans each 162 feet long. In 1846 he built a suspension bridge over the Monongahela River at Pittsburgh, and after building several other bridges removed his business to Trenton, N. J., and in 1851 began the construction of the suspension bridge across Niagara River, connecting the New York Central and the Canadian Railway systems. He next built the bridge over the Allegheny River at Pittsburgh and during 1856–67 the bridge connecting Cincinnati and Covington. In 1868 he was chosen chief engineer for the construction of the Brooklyn Bridge; but he died the following year from the effects of an injury to one of his feet. The completion of the structure was carried out by his son. He was the author of ‹Long and Short Span Railway Bridges› (1869).

**ROEBLING, Washington Augustus,** American civil engineer: b. Saxonburg, Pa., 26 May 1837. He was graduated at the Rensselaer Polytechnic Institute, Troy N. Y., in 1857, and joined his father, John A. Roebling (q.v.), in the construction of the suspension bridge across the Allegheny River at Pittsburgh. He served in the Union army, 1861–65; was brevetted lieutenant-colonel in December 1864 for gallant service before Richmond and colonel of volunteers in March 1865 for meritorious service during the war. He joined his father in building the Cincinnati-Covington suspension bridge and became assistant engineer in constructing the Brooklyn bridge. After his father's death in 1869 the entire direction of the work was left in his hands. He found it best to strengthen the design, increasing the anchorages. This was far the largest suspension bridge ever attempted at that date, and he felt the responsibility so strongly and worked so exhaustively that his health broke down, though he continued the supervision from his bedroom, until the bridge was completed in 1883. Since that date he has been engaged as vice-president of the iron and steel wire and wire rope manufacturing concern of John A. Roebling and Sons Company of Trenton, N. J.

**ROEBLINGITE**, a white, massive mineral, recently found at Franklin Furnace, N. J., having the remarkable composition $H_{10}Ca_7Pb_2Si_5S_2O_{28}$, which is interpreted by Penfield as being a combination of five molecules of the silicate $H_2CaSiO_4$ with two molecules of the basic sulphite, $CaPbSO_4$. This is the only known occurrence of a sulphite in nature. Named after W. A. Roebling.

**ROEBUCK**, rō'bŭk, **John Arthur**, English politician: b. Madras, India, 29 Dec. 1802; d. London, England, 30 Nov. 1879. He was called to the bar in 1831. In 1832–37 and in 1841–47 sat in Parliament for Bath and for Sheffield in 1849–68, and again from 1874 until his death. He charged the Aberdeen ministry with mismanagement of the Crimean War, and was instrumental in overthrowing it; he favored the Confederacy in the United States, and supported Beaconsfield in his Eastern policy in 1877–78. In 1879 he became a member of the Privy Council. He wrote ‹Colonies of England› (1849); ‹History of the Whig Ministry of 1830› (1852), etc.

**ROEDIGER**, rē'dĭg-ĕr, **Emil**, German Orientalist: b. Sangerhausen, Thuringia, 13 Oct. 1801; d. Berlin, 15 June 1874. He studied at Halle, where in 1830 he became extraordinary and in 1835 ordinary professor of Oriental languages. He removed to a similar post in Berlin in 1860 and remained there until his death. He contiued the work of Gesenius' ‹Novus Thesaurus Philologicus Criticus Linguæ Hebraicæ et Chaldæ Veteris Testamenti, Editio ii› with indexes, additions and corrections (1858). He edited Gesenius' ‹Hebrew Grammar,› and wrote ‹De Origine et Indole Arabicæ Librorum V. T. Historicorum Interpretationis Libri Duo› (1829).

**ROELAS**, rō-ā'läs, **Juan de las** (El Clérigo Roelas), Spanish painter: b. Seville, about 1558; d. Oliváres, 26 April 1625. He received a university education, and studied painting in Venice, where his work was influenced materially by Titián and by Tintoretto, more particulary by the latter. He was especially strong as a draughtsman and his work is marked by great vigor and power and by splendid color effects. He was appointed prebendary of the chapel at Olivárez in 1603, but lived and worked in Madrid and Seville until 1624, when he removed to Olivárez. His works are listed by Cean Bermudez. Among them are ‹Death of Saint Isidore› (Church of San Isidore, Seville); ‹Martyrdom of Saint Andrew› (Seville Museum); ‹Santiago at Battle of Clavigo› (Cathedral of Seville); ‹Moses Striking the Rock› (Madrid Museum); ‹Conception› (Dresden Gallery); ‹Communion of Saint Theresa› (Hermitage, Petrograd).

**ROELOFS**, rē'lōfs, **Willem**, Dutch painter and naturalist: b. Amsterdam, 10 March 1822; d. 1897. He early made his home in Utrecht, where he learned to appreciate the beauty of the Netherlands landscape. In 1845 he began his art career in The Hague, and three years later went to Brussels, thus completing his studies of the Dutch masters. From Belgium he passed to France and received the great artistic impulse of his life from the French landscape painters, who represent the aspects of nature as interpretative of spiritual moods. Thus he learned to depict what we may style the transitions of color and light in scenery with a certain dramatic intensity, and preferred the portrayal of dazzling light effects and violent contrasts in color; as when the sunlight pours like a torrent through gaps of leafage into the dark forest depths. He traveled through the whole of Holland and gathered subjects and *motifs* for his pictures from many obscure and unfamiliar spots, painting with equal facility in oil and water color. He was also a skilful etcher. As a naturalist he was well known among students of entomology.

**ROENTGEN, Wilhelm Konrad,** German physicist: b. Lennep, Prussia, 27 March 1845; d. Munich, 10 Feb. 1923. He took his Ph.D. at Zürich in 1869, and later became an assistant to Kuntz at Würsburg. He was professor at Hohenheim, Strassburg and Giessen, and in 1885 became professor of physics and director of the physical laboratory at Würsburg. In 1895 he discovered the rays known by his name (see X-Ray), and which made him famous. He was awarded the Rumford Medal of the Royal Society, London, in 1896; the Barnard Medal of Columbia University in 1900; and the Nobel Prize in physics in 1901. From 1899 he was professor of experimental physics at Munich. He is the author of ‹Annalen der Physik und Chemie,› embodying the results of numerous experimental labors.

**ROGATION DAYS,** the Monday, Tuesday and Wednesday next before Ascension Day: so-called because they are observed as days of solemn supplication, with processions and chanting of the Litanies (Greek *litaneia,* supplication; equivalent to Latin *rogatio*). The custom of processions on these days had its rise in the city of Vienne in Gaul about the middle of the 5th century, when, the city having been visited with earthquakes, fires and other grave calamities, the bishop, Saint Mamertus, ordered a solemn fast and public supplication of three days to appease the divine indignation: and thereafter the three days' supplication was practised annually, the custom spreading throughout Gaul and beyond the Alps. Everywhere these processions were suppressed in England after the triumph of the Reformation, yet in some localities the perambulation of the boundaries of parishes on the «gang-days» is still kept up.

**ROGER I**, count of Sicily: b. Normandy, about 1031; d. Mileto, Calabria, 1101. Roger's brothers, Drago, Humphrey, William and Robert Guiscard, had acquired fame in Italy, and obtained possession of the county of Aversa, when he was summoned thither by his brother Robert, and landed in Apulia in 1057. The two brothers, Robert, the eldest, and Roger, the youngest, founded the kingdom of the Two Sicilies. Roger in 1063 defeated the Saracens at Ceramium, and was thereupon confirmed by the pope in all his conquests in Sicily. He took the title of Count of Sicily, and in spite of certain disputes between the brothers, the complete subjugation of Sicily was the result of their joint efforts. After the death of Robert Guiscard in 1085 the Norman power in Italy came into Roger's hands. The general support given to him by the pope freed him from many dangers. In 1098 Urban II gave him a free brief (the genuineness of which has, however, been questioned), that he would send no legate to Sicily without Roger's consent and left it to him to decide what bishops should attend the general assemblies of the Church and whom he should detain for the service of the kingdom. With this extension of his spiritual rights Rogers introduced many important improvements. Consult Schack, ‹Geschichte der Normanen in Sicilien› (1889); Caspar, E. L. E., ‹Roger II› (Innsbruck 1904).

**ROGER II,** king of Sicily: b. about 1095; d. February 1154, second son of Roger I. His elder brother, Simon, died in 1102, and during his minority the government was administered first by his mother, Adelheid, a daughter of the Margrave Boniface of Montserrat, and then by Prince Robert of Burgundy. The free barons of the land, however, leagued with Pope Honorius II to break the Norman ascendency. They had no success, and the pope voluntarily confirmed Roger in the possession of Apulia and Calabria. Pope Anacletus extended the confirmation to Capua and Naples; and in 1130 Roger received the title of king. He now pressed so hard upon the barons that Rainulf of Avellino, Robert of Capua, Servius of Naples and others revolted, receiving support from the German and Greek emperors, Lothar and Emmanuel, and the influence of the anti-pope, Innocent, who excommuniacted the Sicilian monarch, Roger in 1132 was defeated by them in an engagement; but having promptly assembled a new army suddenly recovered all he had lost, and although the revolt lasted till 1136 it terminated to Roger's advantage. He took Malta and the adjacent islands, and afterward made himself master of Tripoli. With a second fleet he sailed to Madia, and took it in 1148. At the same time he led an expedition against the kingdom of Greece, in which he took Corfu and Thebes, and plundered Corinth, Athens, Cephalonia and Negropont. In 1152 he extended his dominion from Tripoli to Tunis, and from the desert of Mohrab to Kairwan. The peace which followed he turned to good account, reforming the law, introducing order into the administration and patronizing science. Consult ‹Geschichte der Normanen in Sicilien› (1889); Caspar, E. L. E., ‹Roger II› (Innsbruck 1904); Curtis, E., ‹Roger of Sicily› (New York 1912).

**ROGER OF HOVEDEN,** or **HOWDEN,** English historian: lived in the last half of the 12th century; d. Hoveden, now Howden, East Riding of Yorkshire. He was a lawyer, in holy orders, and lived at the court of Henry II whom he served in many diplomatic and professional capacities. His latter days were spent as a prebend of the collegiate church at Howden, to which he had retired on the death of his royal master. The history or chronicle which he wrote during his half monastic retirement was based upon ‹Historia Saxonum vel Anglorum post Obitum Bedæ› (1101). The main additions made by Roger de Hoveden to this work include the miracles of Edward the Confessor; an abstract of the charter by which Hominburgh and Brackenholm were ceded by William the Conqueror to Durham; a list of French knights at the siege of Nice. Naturally the most valuable part of the Chronicle is that which relates to the time in which Roger lived (1169–92). Edward I in 1291 caused diligent efforts to be made to secure a copy of it, that he might collect therefrom evidence bearing on the vexed question as to the homage due the king of England from the Scottish Crown. The Chronicle was first printed in 1696. Consult Morley, Henry, ‹English Writers› (Vol. III, London 1864–67).

**ROGER OF WENDOVER,** English chronicler: d. 1237. He was a monk in Saint Alban's Abbey, and lived to be prior of Belvoir. His chronicle extends down to 1235, and bears the title ‹Flores Historiarum› in the ‹Historia Major.› His account up to 1189 is supposedly based on the compilation of John de Cella, the 21st abbot of Saint Albans. The work was continued by Matthew of Paris. The best edition is by Coxe (4 vols., London 1841–42). The work of Roger is not entirely accurate and trustworthy.

**ROGERS, Fairman,** American civil engineer: b. Philadelphia, 15 Nov. 1833; d. Vienna, Austria, 23 Aug. 1900. He was graduated from the University of Pennsylvania in 1853, was lecturer on mechanics at Franklin Institute, Philadelphia, in 1853–65, and professor of civil engineering at the University of Pennsylvania 1855–70. He was a volunteer in the Union army in 1861 and completed the survey of the Potomac River northward from Blakiston Island in 1862. He was a trustee of the University of Pennsylvania in 1871–86, presented to the university a valuable library of works on engineering in 1878, and finally resigned his trusteeship because of continued residence abroad. Besides various valuable scientific papers he wrote ‹Terrestrial Magnetism and the Magnetism of Iron Ships› (1883); and ‹Manual of Coaching› (1900)).

**ROGERS, Henry Darwin,** American geologist: b. Philadelphia, 1 Aug. 1808; d. near Glasgow, Scotland, 29 May 1866. He was appointed professor of physical sciences at Dickinson College, Carlisle, Pa., in 1830, studied in London in 1831, was lecturer on geology at Franklin Institute in 1833–34, and in 1835–46 was professor of geology and mineralogy at the University of Pennsylvania. In 1835 he made a geological survey of the State of New Jersey, and was appointed geologist in charge of the survey of Pennsylvania in 1836. The survey was interrupted in 1841–51 by lack of appropriations, and Rogers was engaged as an expert for various coal companies, until he resumed the survey which was then concluded in 1854. The final report of the survey was entrusted to him, and he completed the work in Edinburgh. From 1857 until his death he was professor of geology and natural history at the University of Glasgow. He published ‹Description of the Geology of the State of New Jersey› (1840); ‹The Geology of Pennsylvania, a Government Survey› (1858); numerous geological reports.

**ROGERS, Henry Huttlestone,** American capitalist: b. Fairhaven, Mass., 1840; d. 19 May 1909. He was educated in the schools of his native town, and afterward was connected with the Standard Oil Company, of which he eventually became a large stockholder and a vice-president. He was also president of the

Amalgamated Copper Company (1901); director of the United States Steel Corporation, the National Transit Company and numerous other great corporations. Of the great wealth acquired through his business enterprises he devoted large sums to public and benevolent uses, especially for the benefit of Fairhaven. Among his gifts to the town are two schools, a town hall, the Millicent Library (a memorial to his deceased daughter), a Masonic building, and memorial church buildings, comprising a group said to be excellent examples of Tudor architecture, the church itself being perhaps the finest of its size ever built in America. These buildings were erected in memory of the giver's mother. He also built at Fairhaven, and presented to the Millicent Library, a system of waterworks from which it derives an income; and as superintendent of streets he made, presumably in great part at his own expense, vast improvements in the public highways.

**ROGERS, Henry J.,** American inventor: b. Baltimore, Md., 1811; d. there, 20 Aug. 1879. He is known as the inventor of a code of flag signals, adopted by the United States in 1846, and was also the originator of a code of signals in which colored lights are used. As an associate of Samuel F. B. Morse (q.v.) he was instrumental in constructing the first telegraph line, and was the inventor of several important telegraphic instruments, and was one of the organizers of the first telegraph companies in the United States, the Magnetic Telegraph Company, established in 1845. He served in the Civil War as acting master of the volunteer navy. Subsequently he was prominently identified with the American, the Bankers' and Brokers', the Southern and Atlantic, and the Western Union Telegraph companies. His writings include ‹The Telegraphic Dictionary and Seamen's Signal Books› (1845); ‹The American Code of Marine Signals› (1854); and, in collaboration with W. F. Larkins, ‹Rogers' Commercial Code of Signals for All Nations› (1859).

**ROGERS, Henry Wade,** American lawyer: b. Holland Patent, N. Y., 10 Oct. 1853. He was graduated at the University of Michigan in 1874 and was admitted to the bar in 1877. In 1883 he became professor in the law school of the University of Michigan and was its dean from 1885 to 1890. From 1890 to 1901 he was president of Northwestern University, and in the latter year became connected with the Yale Law School, where he was dean until 1913. In 1913 he became United States circuit judge. Rogers has been actively engaged in the work of the Methodist Church and has sought in the advancement of legal education, prison reform and the furtherance of peace. He has written ‹Illinois Citations› (1881); ‹Expert Testimony› (1883), and ‹Introduction to Constitutional History as seen in American Law› (1889).

**ROGERS, Howard Jason,** American educator: b. Stephentown, N. Y., 16 Nov. 1861. His early education was obtained in public schools and at the Pittsfield, Mass., High School; after graduation in 1880 he entered Williams College, from which he was graduated A.B. in 1884. He was admitted to the New York State Bar in 1887. From 1884-92 he was teacher of history and literature in the Albany Boys Academy; superintendent of the New York State Educational Exhibit at the World's Columbian Exposition, Chicago, 1892–94; acting-secretary of the New York commission there, and editor of the official report of the commission, 1894–95; deputy-superintendent of public instruction, New York State, 1895–1901; director of education and social economy for the United States commission at the Paris Exposition of 1900. At the Saint Louis Exposition, 1904, he was chief of the departments of education and of social economy, and also director of congresses and editor of the ‹Proceeding› of the International Congress of Arts and Sciences. In April, 1904, he became first assistant commissioner of education of the State of New York, having charge of higher education. He was decorated, in 1901, by the French Republic with the Order of the Legion of Honor of France, and promoted to the rank of *officer* in 1904; in 1904, by King Victor Emanuel III of Italy, with the Order of Chevalier of Saint Maurice and Lazare; by King Oscar II of Sweden, with the Order of the North Star; and in 1905 by Emperor William II of Germany, with the Order of the Red Eagle, rank of officer, and by King Leopold II of Belgium with the Royal Order of Leopold.

**ROGERS, Jacob S.,** American manufacturer: b. Paterson, N. J., 1823; d. New York, 2 July 1901. In 1856 he became head of the Rogers Locomotive and Machine Works of Paterson. He retired from active business in 1897, and upon the completion of outstanding contracts closed the works 1 Dec. 1900. He bequeathed the bulk of his estate to the Metropolitan Museum of Art, New York. Litigation was begun by other legatees, but a settlement was effected by the payment to these of $250,000. The residuary estate, about $5,000,000, went to the museum.

**ROGERS, James Edwin Thorold,** English economist: b. West Meon, Hampshire, 1823; d. Oxford, 12 Oct. 1890. He was educated at King's College, London, and at Oxford, took orders in the Established Church, and was appointed curate of Saint Paul's, Oxford. After 1860 he lost sympathy with the Tractarian movement and in 1870 was the first to take advantage of the new Clerical Disabilities Relief Act to resign his orders. He received the Tooke professorship of statistics and economic science at King's College, London, in 1859. In 1862 he was elected for five years Drummond professor of political economy at Oxford, but failed of re-election at the end of that term on account of his advanced religious views. He was again elected to the chair in 1888, however, after the death of Bonamy Price, who had held the post in the interval. In 1880 he entered Parliament for Southwark and in 1885 was elected for Bermondsey; but his adoption of Gladstone's home rule policy in 1886 lost him his seat in the general election of that year. His great work is his ‹History of Agriculture and Prices in England› (1866–93), covering the period from 1259 to 1793. Based upon this was his ‹Six Centuries of Work and Wages› (1884).

**ROGERS, John,** English Reformed clergyman, first martyr in the persecution under Queen Mary: b. Deritend, Aston parish, near

Birmingham, about 1500; d. London, 4 Feb. 1555. He obtained his education at Cambridge in 1532–34, was rector of Trinity and Less, London, and then went to Antwerp as chaplain to the English merchants. There, it is said, he was led by William Tindall, then busy on the translation of the Old Testament into English, to change his religious views. He then took charge of a Protestant congregation at Wittenberg, and prepared for the press an English rendering of the Bible, including Tindall's New Testament, and Old Testament as far as the end of 2 Chronicles. His part in the translation was slight, but his marginal notes formed the earliest English commentary on the Scriptures. The whole constituted the second complete version in English, Coverdale's having appeared in 1535, while this appeared, with the pseudonym «Thomas Matthew» on the title-page, in 1537. In 1548 Rogers returned to England, in 1550 was simultaneously made rector of Saint Margaret Moyses, London, and vicar of Saint Sepulchre there. In 1551 he received the prebend of Saint Pancras in Saint Paul's Cathedral. In 1553 he preached twice at Paul's Cross, the second time against Catholicism (6 August), three days after Queen Mary's arrival in London. He was shortly deprived of the emoluments of his benefices, on 27 Jan. 1554, imprisoned at Newgate at the instance of Bonner, new bishop of London, and after two examinations (22, 29 January), was burned at the stake at Smithfield; showing, says Fox, «most constant patience, . . . exhorting the people constantly to remain in that faith and true doctrine which he before had taught.» Consult Fox, ‹Book of Martyrs›; and the biography by Chester (1861).

**ROGERS, John,** American sculptor: b. Salem, Mass., 30 Oct. 1829; d. New Canaan, Conn., July 1904. In early life he developed a talent in clay modeling; and in 1858 went to Europe where he studied under the best masters in Paris and Rome. He returned to the United States in 1859, and modeled a large number of statuettes, of which his first group, ‹The Checker Players,› attracted popular attention. Many of these «Rogers Groups» pertained to the Civil War and elicited general popular approval rather than the unstinted admiration of the art critic. He also executed the equestrian statue of General Reynolds, now at the city hall in Philadelphia.

**ROGERS, Randolph,** American sculptor: b. Waterloo, N. Y., 6 July 1825; d. 15 Jan. 1892. He studied art in Europe from 1848 to 1850 when he returned to the United States, where he executed a statue of Bulwer's blind heroine ‹Nydia› and a figure of President John Adams. He for five years had a studio in New York, but established himself in Rome in 1855. In 1858 he began the bronze doors for the capitol at Washington and subsequently executed several portrait statues and memorial monuments in Providence, Richmond, Detroit and other cities. His colossal figures of Generals Lewis and Nelson, for the Washington monument, which Crawford had begun to raise near Richmond, are good specimens of his work. Among his other statues is that of Seward in Madison Square Park, New York. Perhaps one of his best works is the figure of the ‹Resurrection Angel› for the tomb of Colonel Colt in Hartford, Conn.

**ROGERS, Robert,** American author and soldier: b. Dunbarton, N. H., 1727; d. London, England, 18 May 1795. He raised a company of soldiers known as «Rogers' Rangers» and commanded them efficiently during the French and Indian War of 1755–63. He visited England in 1765 and was appointed governor of Mackinaw, Mich., but while holding this office was charged with designs for delivering his own fort to the French and was sent to Montreal in irons. At the outbreak of the American Revolution he declined a commission in the Colonial army, though professing a sincere interest in the cause of the colonies, and later aroused the suspicions of Washington. He was secured but was released on parole, which he broke, accepted a commission in the British army and organized the «Queen's Rangers,» recruits to which he promised their «proportion of rebel lands.» Shortly after 1776 he went to England. He was proscribed and banished by the provincial government of New Hampshire in 1778. He wrote ‹A Concise Account of North America› (1765); ‹Ponteach, or the Savages of America,› a tragedy in verse, now very rare (1766); and ‹A Diary of the Siege of Detroit in the War with Pontiac,› first published in 1860.

**ROGERS, Robert Cameron,** American poet: b. Buffalo, N. Y., 7 Jan. 1862. He was graduated from Yale in 1883, and has since published ‹Wind in the Clearing and Other Poems›; ‹For the King and Other Poems›; and in prose, ‹Will o' the Wisp,› a sea tale; and ‹Old Dorset: Chronicles of a New York Country Side.›

**ROGERS, Robert William,** American Orientalist: b. Philadelphia, Pa., 1864. He was graduated at the University of Pennsylvania in 1886, and later studied at Johns Hopkins, Haverford and Leipzig. He was professor of the English Bible and Semitic history at Dickinson College in 1890–92; and since 1893 he has been professor of Hebrew and Old Testament Exegesis at Drew Theological Seminary. He has also been an extension professor of Columbia since 1917. Author of ‹Two Texts of Esarhaddon› (1889); ‹Inscriptions of Sennacherib› (1893); ‹History of Babylonia and Assyria› (2 vols., 1900); ‹Cuneiform Parallels to the Old Testament› (1912); ‹The Recovery of the Ancient Orient› (1912), etc.

**ROGERS, Samuel,** English poet: b. Stoke-Newington, London, 30 July 1763; d. London, 18 Dec. 1855. After attendance at private school he entered the Rogers banking establishment as a clerk, but his favorite pursuits were poetry and general literature. In 1786 he printed anonymously ‹An Ode to Superstition, with Some Other Poems.› His ‹Pleasures of Memory,› with which his name is principally identified, appeared in 1792. It is a carefully finished, graceful production, but somewhat deficient in force and vigor, and though everyone is familiar with the name, the ‹Pleasures of Memory› is a poem that at the present day is comparatively little read. It was received with unbounded applause, while the reputation of the author was still further confirmed by the publication in 1798 of ‹An Epistle to a Friend and other Poems.› He now built the celebrated house in Saint James' street, Westminster, long made the centre of intellectual society, which he had in part decorated by Stothard and Flaxman and which was filled with antiques, books and art-works, all selected in admirable taste. It ought also to be recorded that, though of great brusqueness and bitter of tongue, no man was more generous in relieving distress or assisting struggling genius; and Sheridan, Moore, Campbell and others were all indebted at different times to his generosity. He published in 1810 his poem 'Columbus,' which was severely handled by the *Quarterly Review* and met with little success. 'Jacqueline, a Tale,' appeared in 1814, in the same volume with Lord Byron's 'Lara.' The same year he visited Paris, extending his tour to Italy and remaining abroad for several years. On his return in 1819 he published the poem 'Human Life,' and in 1822 appeared the first part of his 'Italy,' a series of poems descriptive of the scenery and antiquities of that country, and perhaps the finest of all his works. Continuations of it followed at successive intervals and a complete edition in 1830, beautifully illustrated by Prout, Stothard and Turner, which, with an illustrated edition of his other poems, composes two octavo volumes, was issued at a large expense to the author. It proved, however, a remunerative speculation. In 1850 Rogers was offered the laureateship vacated by the death of Wordsworth, but declined the appointment, which was bestowed on Tennyson. His unique collection of works of art was disposed of by auction after his death. Rogers' long life saw many literary changes, from the times of Goldsmith and Johnson to those of Thackeray and Dickens. He was a kind of English «autocrat of the breakfast table,» famous for his anecdotes and bon-mots, and his discussions of politics and art. He was certainly a representative, though among the less prominent, of a brilliant period of English poetry, with him care and taste serving for genius. A volume of his 'Table Talk' was published by Alexander Dyce (1860). Consult Clayden, 'Early Life of Samuel Rogers' (1887) and 'Rogers and His Contemporaries' (1889). The correspondence, journals and memoirs of the earlier 19th century abound in references to him.

**ROGERS, William,** English clergyman and educational reformer: b. London, 24 Nov. 1819; d. there, 19 Jan. 1896. He was educated at Baliol College, Oxford, and at Durham University and was ordained in the Anglican Church in 1843. He was appointed perpetual curate at Saint Thomas Charterhouse in 1845 and labored in that district for 18 years, establishing schools for the poor and greatly ameliorating the condition of the poor generally. He was a member of the commission to inquire into popular education in 1858 and in 1870 became a member of the London school board. He was appointed chaplain in ordinary to the queen in 1857 and rector of Saint Botolph's, Bishopgate, in 1863. He continued a zealous worker for the establishment of schools and his determined stand for their secular standing earned for him the sobriquet of «Hang-theology Rogers» through his impatience at the objection made to «godless education.» He secured the erection of the Cowper street schools and the completion of Bishopgate Institute crowned his lifework. Consult his 'Reminiscences' (London 1888).

**ROGERS, William Augustus,** American astronomer: b. Waterford, Conn., 13 Nov. 1832; d. Waterville, Me., 1 March 1898. He was graduated from Brown University in 1857, engaged in teaching at Alfred University and in 1858 accepted its chair of mathematics and astronomy. In 1864-65 he served in the United States navy and in 1866-67 studied at Yale, but resumed his duties at Alfred after each interruption and under his direction the observatory there was built and equipped. He was appointed assistant at the Harvard Observatory in 1870 and became assistant professor of astronomy in 1877. He accepted the chair of astronomy and physics at Colby University in 1886 and remained there until his death. His work at Harvard Observatory consisted of observing and mapping all the stars down to the ninth magnitude, in a narrow belt a trifle north of our zenith, a task which consumed 11 years in observations and 15 years for their reductions. He overcame the difficulty of finding micrometer spiderwebs suitable for his work by etching glass plates with hydrofluoric acid, an expedient which proved so successful that he furnished the government with the plates used by the expedition to observe the transit of Venus. He was an acknowledged authority in the micrometrical field and established standards of measurement for practical mechanical work. He was an active member of various scientific societies and published nearly 70 papers concerning his specialties. He also published, in the 'Annals of Harvard Observatory,' 'Observations Made with Meridian Circle, 1871-72'; 'Catalogue of 8,627 Stars between 49° 50′ and 50° 10′ of North Declination, 1875'; 'Journal of Zone Observations During the Years 1875-1833,' etc.

**ROGERS, William Barton,** American geologist and physicist: b. Philadelphia, 7 Dec. 1804; d. Boston, 30 May 1882. He was educated at William and Mary College, gave scientific lectures before the Maryland Institute in 1827 and in 1828 became professor of natural philosophy and chemistry in his alma mater. From 1835 until his resignation in 1853 he was professor of natural philosophy in the University of Virginia. He added to the course mineralogy and geology; and organized and directed the Virginia geological survey until its discontinuance in 1842. During his occupancy of this chair he devoted much of his time to original researches in geology, chemistry and physics. He was also a leading member of the Association of American Geologists and Naturalists (organized 1840), and to its *Transactions* contributed important memoirs, including observations on the temperature of coal mines in eastern Virginia. In 1853 he removed to Boston, where he continued his researches and voluminous contributions to scientific journals of the United States and Europe, and in 1862 lectured before the Lowell Institute on «The Application of Science to the Arts.» At the request of several citizens of Boston, he drew up in 1859 a scheme entitled «Object and Plan of an Institute of Technology,» to include a society of arts, a museum of arts and a school of industrial science. He then memorialized the State legislature and at length obtained from the State a charter (1862), and the grant of a tract in the Back Bay district upon which to place the buildings of the institution. Chosen the first president of the Massachusetts Institute of Technology, he was made also professor of physics and geology and in 1864 visited Europe for the purchase of scientific instruments and appliances. He organized the system of teaching which still in general obtains in the Institute and whose leading feature was laboratory instruction not only in chemistry, but in physics, mechanics and mining. He resigned his post as president in 1870, but resumed his duties from 1878 to 1881, when he was succeeded by Francis A. Walker (q.v.). In 1847 he presided at the meeting by which the Association of American Geologists and Naturalists was enlarged into the American Association for the Advancement of Science; was made president of the latter in 1875; was a corporate member of the National Academy of Sciences; became its president in 1878; and was a founder and the first president of the American Social Science Association. He has been characterized as one who had in a high degree «the faculty of presenting the claims of science on popular interest and respect with force and lucidity.» His gifts of expression as speaker and writer were excellent. Many of his researches added materially to scientific knowledge. Among his books were ‘The Strength of Materials’ (1838); ‘The Elements of Mechanical Philosophy’ (1852); and ‘Papers on the Geology of Virginia’ (1884), comprising his yearly reports in 1836–40. Consult the ‘Life and Letters,’ published in 1897.

**ROGERS,** Ark., town of Benton County, 90 miles north of Fort Smith, on the Kansas City and Memphis and the Saint Louis and San Francisco railroads. The town has flour mills, lime works, vinegar and pickling plant and a hub and spoke factory. Pop. (1920) 3,318.

**ROGERSVILLE,** rŏj′ẽrz-vĭl, Tenn., village, county-seat of Hawkins County, on the Southern Railroad, about 45 miles east-northeast of Knoxville. It is in a fertile valley, bordered by mountainous regions rich in variegated marble and building stone and considerable coal. The chief manufacturing establishments are flour mills, furniture factories and machine shops. A number of the villagers have employment in the marble quarries. The educational institutions are the McMinn Military Academy and the Swift Memorial Institute. The latter was founded in 1848 by the Presbyterian Church. There are good public schools and two school libraries. The national bank has a capital of $75,000. Pop. 1,582.

**ROGERSVILLE, Engagements at.** On 5 Nov. 1863 Col. Israel Garrard, with the 7th Ohio Cavalry, 2d Tennessee mounted infantry, and a battery of four guns, occupied Rogersville, Tenn., camping near the town. During the day Gen. W. E. Jones, with about 2,500 Confederate cavalry, crossed the Holston River near Kingsport, made a night march by roads badly guarded and at daybreak of the 6th surprised and captured Garrard's outposts, and advanced toward his camp, attacking and routing the 7th Ohio, Garrard and a few of his men escaping to Morristown. Jones then attacked the Tennessee regiment, which made a good resistance, but was soon surrounded and obliged to surrender. The Union loss was about 20 killed and wounded, with 650 men, four guns, two colors, 1,000 horses and mules and 40 wagons and ambulances captured. The Confederate loss, as reported, was 10 killed and wounded. News of the disaster caused a hasty retreat of the Union forces from Jonesboro and Greeneville to Bull's Gap, where it was learned that Jones had not advanced beyond Rogersville and the retreat ended. At the same time Jones retreated in an opposite direction to the Virginia line.

On 21 Aug. 1864 Rogersville was held by a small force of Confederate cavalry, under Colonel Watkins, which was attacked at daybreak by a detachment of the 13th Tennessee cavalry, under Lieutenant-Colonel Ingerton. Several Confederates were killed and wounded and Watkins, with 25 of his men, captured, the remainder escaping to Kingsport. On 8 Oct. 1864 Gen. John C. Vaughn, having driven a Union force from Kingsport, followed it to Rogersville and attacked with his brigade, killing 10 and wounding several Union troops and driving the remainder to Bull's Gap. On 10 December Gen. A. C. Gillem, with a Union brigade, marched from Knoxville, on the 12th drove in the pickets of General Duke's brigade, and followed to Big Creek, four miles from Rogersville, where the Confederates had taken a strong position. With a part of his command Gillem made a flank movement, charged with the other part and drove the Confederates from position and through Rogersville, in the direction of Kingsport, where they were overtaken next day and routed, with some loss. Consult ‘Official Records,’ Vols. XXXI, XXXIX and XLV.

E. A. Carman.

**ROGET,** rō-zhā′, **Peter Mark,** English physician: b. London, 18 Jan. 1779; d. Malvern, Worcestershire, 12 Sept. 1869. He was educated at the University of Edinburgh and was appointed physician to the Manchester Infirmary in 1804. In 1808 he removed to London, where he became physician to the Northern Dispensary. He was elected a fellow of the Royal Society in 1815 and for 20 years served as its secretary. He was professor of physiology at the Royal Institute in 1833–36 and in 1837 was active in the establishment of the University of London, in the senate of which he continued a member until his death. He retired from practice in 1840 and devoted himself to literature and to mechanics, for which he had decided talent. He wrote ‘Animal and Vegetable Physiology Considered with Reference to Natural Theology’ (1834); ‘Physiology and Phrenology’ (1838); and the famous ‘Thesaurus of English Words and Phrases’ (1852).

**ROGGEVELD** (rŏg′gĕ-vĕld) **MOUNTAINS,** in Africa, in the southwestern division of Cape Colony, running northwest to southeast with an average height of 5,000 feet. They form a western continuation of the Nieuwveld Mountains.

**ROGIER,** rō-zhē-ā, **Charles Latour,** Belgian statesman: b. Saint Quentin, 17 Aug. 1800; d. Brussels, 27 May 1885. He was educated at the University of Liège and at the outbreak of the Belgian revolution in September 1830 became a revolutionary leader in Brussels. On 24 September he was made president of the administrative commission and later went as a delegate of the provisional government to Antwerp. After an armistice had been arranged with Holland, he exercised absolute power in the reorganization of the administration of the city. He represented Liège in the National Congress, voted to establish a hereditary monarchy, and proposed the adoption of the elective second chamber. He became governor of the province of Antwerp in 1831 and the next year Minister of the Interior. He retired in 1834 after having carried a law providing for the establishment in Belgium of the first railway in Europe. From 1834 to 1840 he was again governor of Antwerp; and leader of the Liberal party in opposition 1841–47. He became Prime Minister and Minister of the Interior in 1847 and by his energy and foresight Belgium escaped the revolutionary crisis that involved Europe in 1848. In 1850 he organized secondary education under control of the state; but retired from office in 1852. Again becoming Prime Minister in 1857 one of the first acts of his ministry was the fortification of Antwerp. In 1861 he became Minister of Foreign Affairs and succeeded in freeing the navigation of the Scheldt, which fact contributed to make Antwerp one of the important ports of Europe. He retired from ministerial office in 1868, though he sat for Tournai until his death.

**ROGUE MONEY,** the popular name for an assessment formerly levied on every county in Scotland «for defraying the charges of apprehending criminals or subsisting them when apprehended and of carrying on prosecutions against them.» This tax was first imposed by a statute of George I, on the assertion that criminals were in the habit of escaping punishment for lack of the funds necessary to bring them to justice. The freeholders in each shire were directed to fix the assessment at any of the head courts yearly and to appoint collectors. By an act of Victoria rogue money in the shires was abolished and in lieu thereof power was conferred on the commissioners of supply to levy by date a «county general assessment.»

**ROGUE** (rōg) **RIVER INDIANS,** the name applied to a number of Indian tribes on Rogue River, southwestern Oregon, most of which belonged to the Athapascan stock, but the members of the Takilman stock were also included. They were not friendly to the early settlers, and in 1853, with neighboring tribes, they resented the continued encroachments on their lands by conducting a succession of massacres and outrages which continued until 1856, when they were compelled to submit to American troops and sent to Grande Ronde Reservation. Here they remained until the spring of 1857 when they were finally established on Siletz Reservation. Here, with five other tribes, they now number 453.

**ROHAN, Henri de,** ŏṅ-rē dė rō-äṅ, DUKE OF, French general: b. Castle of Blain, Brittany, 21 Aug. 1579; d. Königsfeld, 13 April 1638. In his 16th year he joined the court of Henry IV, whose childless marriage led him to entertain the hope that, as a very near relative, he might one day succeed him in Navarre, but in 1610 the assassination of the king dashed all his hopes. The opposing parties again flew to arms and Rohan placed himself at the head of the Calvinists. But Louis XIII and Richelieu, the all-powerful minister, annihilated the political existence of the Huguenots. Rohan then withdrew from his native land, and in exile wrote ‘Mémoires sur les choses advenues en France depuis la mort de Henri IV’ (1630). In the wars of Venice against Austria he commanded the troops of the republic till the Peace of Cherasco in 1631. Later he went to Geneva, where he composed his ‘Mémoires et lettres sur la guerre de la Valteline’ (1638). In Germany the Roman Catholic league had made war against the Protestants, and Rohan in 1638 joined Bernard of Weimar, then commanding the Protestant army on the Rhine. He was wounded at the battle of Rheinfelden, 28 Feb. 1638, and his death followed shortly afterward. Besides the works mentioned above he wrote ‘De l'intérêt des princes et états de la Chretienté’ (1638).

**ROHILKHAND,** rō-hĭl-kŭnd' or -känd', or **ROHILCUND,** India, a division of the United Provinces of Agra and Oudh, bounded north by the Himalayas, separating it from Kumaon, west and southwest by the Ganges, and east and southeast by Oudh; area, 10,885 square miles. The surface is a plain, with a gradual slope south, in which direction its principal streams, Ramganga, Deoha and others flow. Its north frontier is occupied by an extensive forest; elsewhere palms, the sugar-cane, cotton and the finer fruits of the temperate zone flourish. It takes its name from the Rohillas, an Afghan tribe, who gained possession early in the 18th century. The division is subdivided into the districts Bijnur, Muradabad, Budaon, Bareli, Terai and Shahjahanpur. It encloses the native principality of Rampur. Pop. of division, 5,343,674.

**ROHLFS,** rōlfs, **Anna Katharine Green.** See GREEN, ANNA KATHARINE.

**ROHLFS, Friedrich Gerhard,** German African traveler: b. Vegesack, Germany, 14 April 1831; d. Goderburg, Prussia, 3 June 1896. He was educated at Heidelberg and Göttingen and in 1855–60 served as a surgeon in the French army at Algiers. He traveled through Morocco in 1860 and in 1862 explored the Tafilet Oasis. He traveled in North Africa in 1863 and in 1865, joined the English expedition to Abyssinia in 1867 and in 1868 traveled in Cyrenaica. He conducted an expedition through the Libyan Desert in 1873–74, traveled in North America in 1875–76 and in 1878 again visited Africa, penetrating to the Kufra Oasis. He traveled in Abyssinia in 1880 and in 1884–85 acted as German consul at Zanzibar. He wrote ‘Journey through Morocco’ (1869); ‘Across Africa’ (1874–75); ‘My Mission to Abyssinia’ (1883); ‘What News from Africa’ (1887), etc.

**ROJAS, Fernando de,** Spaniard, the reputed author of the ‘Tragicomedia de Calisto y Melibea,’ known also as the ‘Celestina.’ He flourished during the latter part of the 15th and the first part of the 16th centuries. According to his own confession he wrote the continuation of this very famous work and his addition appeared in 1499. There has been much discussion as to whether he really was the author of the work that he claims as his own. Ticknor and other notable writers on the Spanish literature of the period appear to be willing to take him at his word, while still other critics, like R. Foulché-Delbose, have striven to show that he was an impostor. The ‘Celestina’ is the most dramatic and characteristically Spanish of all works up to the date of its publication. It ran through numerous editions (between 30 and 40) and was immensely popular in its day, not only in Spain, but in France and Italy. Translations of it appeared in French, Latin, Italian, English, German and Dutch. While the work is sparkling with wit and humor and is racy with Spanish idiomatic expressions, customs and descriptions, its grossness is very offensive to modern taste. Yet it was universally read and imitated, not only at the time of its appearance, but for long afterward. It thus came to exercise a very strong and lasting influence upon both the Spanish drama and the Spanish novel. So popular was this work that the name ‘Celestina’ was on everyone's tongue and it passed into a proverb. Hundreds of the sayings from ‘Celestina’ passed into current use and are still to be found among the rich and poor, illiterate and educated, alike, throughout Spain. Naturally scores of imitations of it were written, none of them however in any way equal to the original ‘Celestina.’

**ROJAS Y ZORRILLA,** rō'häs ē thōr-rēl'yä **Francisco de,** Spanish dramatist: b. Toledo, Spain, 4 Oct. 1607; d. about 1648. Information concerning his life is of a fragmentary character and he is frequently confused with several other persons of the same name. He seems to have studied at the universities of Toledo and Salamanca and his work had become famous by 1632, as Montalván mentions him in high terms in his ‘Para Todos’ of that year. In 1644 he was honored with the mantle of the Order of Santiago, an evidence of favor at court. He was author of numerous plays and sacred pieces, but took no pains to preserve his works and many of them have been lost, though he did publish two ‘Parts’ of his dramas (1640–45) and announced a third which never appeared. Among the best of his remaining works are ‘Del rey abajo ninguno’; ‘Entre bobos anda el juego’; ‘Lo que son mujeres’; ‘Casarse por vengarse.’ No complete edition of his remaining works has been published, but an excellent selection is given in Rivadeneyra's ‘Biblioteca de autores españoles’ (Vol. LIV, 1866).

**ROKITANSKY,** rō-kē-tän'skē, **Karl,** Baron von, Bohemian anatomist: b. Königgrätz, 19 Feb. 1804; d. Vienna, 23 July 1878. He studied at Prague and Vienna; became professor of pathological anatomy at the University of Vienna in 1834, and continued there until 1875. His great work, ‘Handbuch der pathologischen Anatomie’ (1842–46), stands as the foundation of the science of pathological anatomy. It was translated by order of the Sydenham Society in 1849–52. In 1869 Rokitansky became president of the Austrian Academy of Sciences.

**ROLAND DE LA PLATIÈRE, Jean Marie,** zhŏṅ mä-rē ro-lan de la plä-tē-ãr, French patriot: b. Thizy (Beaujolais), 18 Feb. 1734; d. Rouen, 15 Nov. 1793. From a humble position in the mercantile world, he rose to eminence in the city of Amiens, in which he held the office of inspector of manufactures. His interests, however, were not in trade, and his views upon political economy and the great problems of government brought him into the ranks of the philosophers of his day. In 1780 he married Manon Jeanne Philipon, whose share in the Revolution was even greater than his own. At the outbreak of the Revolution he joined the Moderate Republican party, during whose brief rule he was made Minister of the Interior. This position he held from March until June 1792, when the Girondists were forced to retire. After the conflict in Paris 10 August, Roland was recalled, but the Jacobin spirit was too strong, and he was forced to flee. Upon hearing of the death of his wife he took his own life. Consult Lamartine, ‘Histoire des Girondins’ (1847; Eng. trans. by Ryde).

**ROLAND DE LA PLATIÈRE, Manon Jeanne Philipon,** wife of Jean Marie Roland (q.v.): b. Paris, 17 March 1754; d. there, 9 Nov. 1793. With a mind bent upon interests far beyond her years from earliest childhood, Mademoiselle Philipon, the daughter of a Paris engraver, developed at 19 remarkable talents, and at 24 into a woman of great brilliancy of intellect, a disciple of Rousseau, the emancipation of the common people her creed, and their deliverers, the philosophers and patriots of France, her friends and counsellors. In 1779 she was married to M. Roland, with whose political fortunes her life was thenceforth bound. Her faith in the outcome of the Revolution was that of a devotee, her enthusiasm the inspiration of a great party. At first the friends and confidants of Robespierre and those who were afterward leaders of the Jacobin element, the Rolands became the defenders of the more moderate republican idea, and were among the greatest martyrs to this cause. On the fall of the Girondists in the summer of 1793, Madame Roland was arrested, and on the 9th of November was guillotined. During her imprisonment she wrote her famous ‘Mémoires,’ which were afterward published, together with her correspondence with the other leaders of the French Revolution. Consult Lamartine, ‘Histoire des Girondins,’ English translation by Ryde (1849); ‘Correspondence de Madame Roland,’ edited by C. Perroud (1901); Tarbell, ‘Life of Madame Roland’ (1896).

**ROLAND,** rō'land (Italian Orlando), hero of romance and one of the paladins of Charlemagne, whose nephew he was reputed to be. His character is that of a brave, unsuspicious and loyal warrior, but somewhat simple in his disposition. The poems of Pulci, ‘Morgante Maggiore’; of Boiardo, ‘Orlando Innamorato’; and Ariosto, ‘Orlando Furioso,’ relate to Roland and his exploits. (See Chanson de Roland; Morgante Maggiore; Orlando Furioso; Orlando Innamorato; Roland Song, The; Rolandslied). Consult Einhard, ‘Vita Caroli Magni’; Turpin, ‘De Vita Caroli Magni et Rolandi’; Schmidt, ‘Ueber die italienschen Heldengeschichten aus dem Sagenkreis Karls des Grossen’ (1820).

**ROLAND SONG, The** (‘La Chanson de Roland’) is the chief French chivalrous epic and almost the oldest to survive. Written before 1080, the creation of a single minstrel who was a true poet, it bears internal evidence of a legendary ancestry stretching back almost to the days of Charlemagne. In 778 that still youthful king made an incursion into Spain and was checked at Saragossa. On his return across the Pyrenees his rear guard was attacked by Basque mountaineers at Roncesvalles and exterminated. Among the dead was Hrodland, Count of Brittany. Breton minstrels were quick to exploit the tragic theme. Roland's fame spread quickly over all France and beyond. In the 11th century his tomb was shown at Blaie, his horn, cracked, at Bordeaux. A minstrel sang of him to the Normans at Hastings in 1066. Forms of the legend earlier than the 'Chanson' can be discerned in a prose chronicle attributed to «Archbishop Turpin» and in the Latin 'Carmen de proditione Guenonis' ('Song of the Treason of Ganelon'). The minstrel of the 'Chanson' introduced many new elements and infused the whole with a nationalizing fervor of patriotic inspiration. The 'Chanson' is preserved only in manuscript written a century after its composition by scribes who were unfamiliar with its language and did some violence to its versification. In the oldest of them it counts 4,002 verses. This was discovered at Oxford by F. Michel and edited by him in 1837 and since often, most elaborately by Léon Gautier in more than 20 editions. Its French shows strong marks of Breton influence and occasionally suggests an effort to combine, without fusing, differing versions of the original. In this form of the legend the Basque mountaineers have become Saracen «barons,» who worship images of Mahomet and Apollo, are able to muster for an ambush 400,000 men in three days and to summon almost equal reinforcements from Babylon and its Ethiopian vassals who seek in vain to cope with the remnant of Roland's 20,000 rear guard. Roland's jealous stepfather, Ganelon, betrays the French to the «pagans.» King Charles, then 35, is for the poet 200 years old, «conqueror of England, Germany, Bavaria, Lorraine, Burgundy, Italy, Brittany and other regions and cities innumerable.» His 12 paladins match the knights of Arthur's Round Table. Roland, the king's nephew, leads them in valor, Oliver in counsel. Archbishop Turpin is their guide in religion, promising paradise to those who die killing Saracens, and bidding them «for penance, hit hard» (line 1138). Prodigies of valor and slaughter pall by iteration but there are many scenes to stir generous blood still, notably where Roland, counselled by Oliver, scorns in proud self-confidence to summon the king to his aid and, when he blows the horn in the last desperate strait, dies, still unscathed, his veins burst by the strain of the supreme call. Very striking, too, is the death of Aude, Roland's betrothed, and the trial of Ganelon. At the end Charles, divinely summoned to new conquests, exclaims, as he plucks his mighty beard, «My God, how toilsome is my life» (line 4001).

The 'Chanson' is framed in *liasses*, strophes of about 15 lines, with assonant endings. The style is vivid, concise, direct. There is but one simile in the whole poem. Its grandeur is in its ideal of devotion, fidelity, courage and honor, its impassioned patriotism and its expression of a spirit of national unity till then unknown to Europe's Middle Age. Its vogue was immediate and wide. It was soon put into French rhymes and adapted to most varied foreign taste in English, Dutch, Danish, German, Norwegian, Spanish, Portuguese and Italian versions. It has been translated into modern French by Petit de Julleville (Paris 1878) and others; into English prose by I. Butler (Boston 1904) and, partially, into verse by Way and Spencer (London 1895). Consult Paris, G., 'Histoire poétique de Charlemagne' (Paris 1905) and 'Légendes du moyen âge' (Paris 1903); also Gautier, L., 'Bibliographie des chansons de geste' (Paris 1897).

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**ROLANDSLIED,** the 'Song of Roland,' the name of several mediæval German versions of the French 'Chanson de Roland' (q.v.). The first was probably made by Pfaffe Konrad in 1131–33, in the service of Henry the Proud; it was called 'Ruolandes liet,' and served as a basis for at least two later versions by other German poets. One was written by a Lower Rhenish poet toward the end of the 12th century, the other by an Austrian poet, called Der Stricker, in the first half of the 13th century; he probably supplemented the older version by using later French poems for additional data. None of the versions produced in any country attain the popular importance, however, of the later Italian Roland poems: Pulci's 'Morgante Maggiore,' Boiardo's 'Orlando Innamorato,' Ariosto's 'Orlando Furioso.' A German poet, Immermann (q.v.) used the episode of Roland's death as the subject for a tragedy, 'Das Tal von Ronceval' (Hamm 1822). Consult Ammann, 'Das Verhältnis von Strickers Karl zum Roland des Pfaffen Konrad, mit Berücksichtigung des Chanson de Roland' (Vienna 1902); Bartsch, 'Über Karlmeinet' (Nürnberg 1861).

**ROLFE, John,** English colonist in America: b. England, about 1585; d. Virginia, 1623. He settled in Virginia in 1610, his wife dying soon after his arrival. He became one of the leading settlers in the colony, and introduced the regular cultivation of tobacco. He was married to Pocahontas (q.v.) in 1613 and took her to England in 1616. After the death of Pocahontas in 1617 he returned to Virginia, was married to an Englishwoman and left several children. He had one son by his marriage with Pocahontas.

**ROLFE, John Carew,** American educator: b. Lawrence, Mass., 15 Oct. 1859. He was graduated at Harvard in 1881, and later studied at Cornell and at the American School, Athens. He was instructor in Latin at Cornell in 1882–85, and in Latin and Greek at Harvard in 1889–90. He became associated with the staff of the University of Michigan in 1890, and was professor of Latin there in 1894–1902. Since 1902 he has been professor of Latin language and literature at the University of Pennsylvania. In 1907–08 he was professor at the American School of Classical Studies at Rome. He edited many textbooks.

**ROLFE, William James,** American Shakespearean scholar: b. Newburyport, Mass., 10 Dec. 1827; d. 7 July 1910. He was educated at Amherst, and after teaching in Wrentham, Mass., became master of the high school, Dorchester, Mass., in 1852. In 1857 he occupied a similar post in the high school at Lawrence, Mass., in 1861 at Salem, Mass., and from 1866 to 1868 at Cambridge, Mass., resigning in 1868 to devote himself to literary pursuits. His Shakespearean labors began in 1867 with his editorship (with J. H. Hanson) of Craik's

‹English of Shakespeare.› In 1870 he issued an annotated edition of ‹The Merchant of Venice› and followed this with other annotated plays till in 1883 a complete edition of Shakespeare had appeared in 40 volumes. This is sometimes styled ‹The Friendly Edition,› a name first suggested by Mary Cowden-Clarke (q.v.). He has also edited ‹Select Poems of Goldsmith› (1875); Gray (1876); Browning (1887); and Wordsworth (1889); a complete edition of Scott (1887); and of Tennyson (1895–98), and other works, and in the author of ‹Satchel Guide to Europe,› revised yearly (1872–1903); ‹Shakespeare the Boy› (1896); ‹Life of Shakespeare› (1901). He lectured much upon Shakespeare and literature in general and in his editions of Shakespeare and other poets he admirably preserved the balance between textual and literary criticism.

**ROLL, Alfred Philippe,** French painter: b. Paris, 10 March 1846. From being a designer of patterns and decorations of various sorts he passed to the Ecole des Beaux Arts at Paris, where he was much attracted to the work of Jerome and Bonnat. The influence of both these teachers is traceable in his pictures, especially that of Bonnat in the duskiness of coloring in his ‹Scenes from the Flood at Toulouse in June 1877,› a picture which gained a medal of the first class and is now in the Havre Museum. In succeeding pictures he developed a passion for naturalism of the most uncompromising character, and in his ‹Feast of Silenus› (1878) in the museum of Ghent, and still more in the ‹Strike of the Colliers› (1880), now in the gallery of Valenciennes, and ‹Labor› (a representation of masons, bricklayers, and carpenters at work on a building), this tendency is conspicuous. These are all blazing sunlight pictures, as if executed *en plein air;* his subsequent works, whether portraits, genre-groups, landscapes or marines, are in like style. They are solidly painted with a matter-of-fact air of reality which is very striking. Among his later works is a canvas crowded with figures, ‹The Centennial Jubilee of the Revolution of 1789› (1893).

**ROLLA, Alessandro,** Italian violinist and composer: b. Pavia, 22 April 1757; d. Milan, 15 Sept. 1841. He was active for many years as musical director at La Scala Theatre and teacher in the conservatory in Milan. He published several quartet and solo pieces both for the violin and the bass viol, which for essential purity of composition and perfection of form stand pre-eminently superior to similar works of his day.

**ROLLA,** rŏl′ạ, Mo., city, county-seat of Phelps County, on the Saint Louis and Santa Fé Railroad, about 48 miles south-southeast of Jefferson City and 110 miles southwest of Saint Louis. It is in an agricultural and iron mining region. Its chief industrial establishments are smelting furnaces, foundries, machine shops, flour and grist mills. It is the seat of the Missouri School of Mines and Metallurgy, a department of the Missouri State University (q.v.), organized in 1871. Pop. (1920) 2,077.

**ROLLAND,** rōl′lạṅ, **Romaine,** French author: b. Clamecy, 29 Jan. 1866. He studied at the Ecole Normale Superieure, Paris, and in 1889–91 was a member of the Ecole Française de Rome. He was for a time professor of the history of art at the Ecole Normale Superieure, and was later called to the chair of history and music at the Sorbonne. He was awarded one-fourth of the Nobel Prize for literature in 1915 for the completion of his ‹Jean Christophe,› a species of rambling novel, written in 10 volumes and carrying much philosophic discussion of life, the sub-titles being ‹L'Aube›; ‹Le Matin›; ‹L'Adolescent›; ‹La Revolte›; ‹La Toire sur la place›; ‹Antoinette›; ‹Dans la Maison›; ‹Les amies›; ‹Le Buisson Ardente›; and ‹Le Nouvelle Journee.› It was translated into English by Cannan, G. (1911–13). His other works include ‹Les origines du théatre lyrique moderne›; ‹Les Loups,› drama; ‹Le Temps,› drama; ‹Vie de Michel Auge›; ‹Vie de Beethoven›; ‹Haendel›; ‹Vie de Tolstoi›, etc. Consult Stephens, W., ‹French Novelists of To-day, Second Series› (1915).

**ROLLE DE HAMPOLE,** rōl dĕ hăm′pōl, **Richard,** English author and recluse: b. Thornton, near Pickering, Yorkshire, about 1290; d. Hampole, near Doncaster, 25 Sept. 1349. He studied at Oxford and at 19 decided to lead a hermit's life. For many years he was a wanderer, leading a holy life devoted to contemplation rather than to making converts, although he occasionally preached. In his later years he became an inmate of the Cistercian nunnery of Saint Mary, near Doncaster, where he died. His life of unquestionable piety, his adherence to the spiritual side of religion and his exalted love of Christ gave him a wide influence over his generation and that succeeding him. He wrote extensively both in English and in Latin, and many of his manuscripts are preserved. ‹The Pricks of Conscience› is a religious poem of 9,624 lines in rhyming couplets and was widely popular; this and his ‹Commentary on the Psalter› constitute his most important works. Of his Latin treatises ‹De Emendatione Vitæ› and ‹De Incendio Amoris› were translated by Richard Misyn (1434–35) and edited by R. Harvey for the Early English Text Society (1896). ‹De incendio amoris› is most interesting because of its autobiographical nature. There is no complete edition of his works but an excellent collection is that of Horstmann, C., ‹Yorkshire Writers: Richard Rolle of Hampole› (2 vols., 1895–96).

**ROLLER,** a tropical bird of the genus *Corasias,* forming the type of the family *Coraciidæ.* These birds are generally of small size, frequently exhibit brilliant colors in their plumage and are confined to the eastern hemisphere. Their food consists partly of insects and partly of nuts and fruits. The common roller (*Coracias garrula*) is found in Africa, whence it migrates in summer into Europe. In size the roller equals the common jay. The back is of a light brown color. The head is bluish-green, as also are the neck and lower surfaces. The lesser coverts of the wings are bright blue; the tail feathers blue, with a greenish lustre. The voice is noisy and harsh. In habits these birds are shy, and frequent forest depths and secluded spots. The four pure white eggs are frequently deposited in the holes of trees or in holes in river banks. The genus *Eurystomus* is nearly similar to *Coracias,* but occupies tropical Africa. Both genera include several distinct species. Consult Evans, ‹Birds› (1900).

**ROLLER BEARING,** a bearing in a machine that utilizes hardened steel rollers to reduce friction, as the Hyatt. See BEARINGS, ANTI-FRICTION.

**ROLLER SKATE,** a skate patented in France as early as 1819. Since that time scarcely a year has passed without the recording of some improvement in wheel skates. Plimpton's improvement consisted in so gearing two pairs of wheels that they would «cramp» when the footplate was canted to either side, and thus cause the skate to move on a curved line. Several years elapsed before the value of the invention was generally recognized; but in the meantime the inventor was busy making improvements and taking out other patents and in 1874 had brought the skate pratically to its present condition. This device of «cramping» the wheels secured the initial success of roller skating. The earlier inventions were crude affairs compared with the modern; the present roller skate combines strength, lightness and ease of action in a marked degree. About 1864 the mania for roller skating appeared in Austria; and in 1866 the «rinking» fever broke out in Australia and spread thence to England and the United States. Since that time the craze has appeared at intervals only to die out again. The most recent form of the roller skate has only two wheels, set one behind the other, resembling the ice skate in its form and action.

**ROLLESTON, Thomas William Hazen,** Irish author and journalist: b. Glasshouse Shinrone, King's County, 1857. He was educated at Trinity College, Dublin, and lived in Germany in 1879–83. He edited the *Dublin University Review* in 1885–86; was Taylorian lecturer at Oxford University in 1892; and was managing director and secretary of the Irish Industries Association in 1894–97. In 1898–1900 he was leader writer for the Dublin *Daily Express,* as well as Dublin correspondent of the London *Daily Chronicle.* He organized lectures and other educational work under the Department of Agricultural and Technical Instruction for Ireland in 1900–05; and was actively interested in the Irish Literary Revival. Author of ‹The Encheiridion of Epictetus› (trans. with introduction and notes, 1881); ‹Life of Lessing› (1889); ‹Treasury of Irish Poetry,› coeditor (1900); ‹Imagination and Art in Gaelic Literature› (1900); Sea Spray,› poems (1909); ‹Myths and Legends of the Celtic Race› (1911); ‹Sacred and Profane Love; a Triology after Richard Wagner› (1914); ‹Ireland and Poland; a Comparison› (1917). etc.

**ROLLIN,** rō-lăṅ, **Ambrose Lucien,** West Indian historian: b. Trois Rivières, Guadeloupe, 1692; d. Point à Pitre, Guadeloupe, 1749. He was appointed deputy-lieutenant of the colony in 1725, an office which he occupied until his death, devoting himself in his leisure to researches upon the Caribes and other Indian tribes. His works show remarkable care and ability and are still accepted as authoritative. They include ‹Histoire des Indiens› (1739); ‹Histoire et description des Caraïbes, leur condition avant la conquête› (1734); ‹Les Incas du Pérou et la conquête Espagnole› (1748), etc.

**ROLLIN, Charles,** French historian: b. Paris, 30 Jan. 1661; d. there, 14 Sept. 1741. He studied theology at the Sorbonne, but did not take orders. In 1688 he obtained the chair of eloquence in the Collège de France, of which he became rector in 1694, and he there revived the study of the Greek language. In 1696 he was chosen coadjutor or head of the Collège de Beauvais. Displaced in consequence of his connection with the Jansenists, he was reinstated in 1720. His productions are ‹Traité des études› (1726–31); ‹Histoire ancienne› (1730 and 1738), his best-known work; and ‹Histoire romaine› (1738–48) down to the war against the Cimbri (completed by Crevier and others). Rollin's writings are distinguished for purity and elegance of style, but are diffuse and prolix, and his historical works are deficient in critical sagacity. There is an edition of his works in 30 volumes (1827), with notes on the historical parts by Guizot. His ‹Ancient History› has been often reprinted in English, but is now quite out of date.

**ROLLIN, Ledru.** See LEDRU-ROLLIN.

**ROLLING MILLS** are machines employed to convert masses of metal into bars, plates and commercial shapes. They consist of rolls in pairs, driven in opposite directions at nearly the same surface speed, and variously grooved and molded, between which the metal is passed while hot. In successive rollings by passing through a series of openings between the rolls known as «passes,» the metal suffers gradual reduction in thickness and a consequent increase in length or breadth, or both, as the case may be. For example, a 15-inch square ingot is reduced to eight inches square by from 12 to 15 passes through the rolls. In very powerful mills such a reduction is sometimes achieved in six or seven passes. See Fig. 1.

The rolls, which are the vital part of the rolling mill, are made of cast steel or a tough cast iron, depending upon the product the mill turns out. For plates and sheets cast iron is used in many mills, the surface of the rolls being «chilled,» rendering them very dense and hard, and capable of a high polish which is imparted to the sheets. If the rolls are unusually long, for making large sheets, they are of forged steel. Steel rolls have an advantage in that their deflection under a given load is only about half as much as with cast iron; they are practically unbreakable; and they hold their corners better against crumbling under the pressure. On the other hand, steel rolls cannot be chilled; their temper is soon removed by the heat of the material passing through them; and they are apt to develop a roughness of the surface, and their corners soon lose their sharpness. In proportioning a roll for heavy work it is the rule to make the length not more than twice the smallest diameter at the deepest groove. It is not uncommon to find rolls for light work up to four times the smallest diameter. The roll is formed so as to have a journal at each end, and this is regularly half the diameter of the body of the roll. The outer extremities of the journal are formed into cross-shaped «wobblers» by which they are driven. As used in the various mills rolls are arranged according to one of two general plans: as «balanced rolls» where the axis of one pair is movable, so as to allow of its being brought closer to the other or vice-versa; and the fixed rolls, whose axes are set in place permanently. In the former type the reduction of an ingot is accomplished by changing the distance between the rolls each time the metal passes; in the second the gradual reduction is made by running the ingot through a series of passes, each smaller than the preceding. The rolls are held in position by housings or frames of great strength, and of such construction that a broken roll may be quickly removed and a new one put in place.

Rolling mills are of four principal designs: (1) the «two-high pull-over» mill, in which there are two rolls set one above the other, the bar being rolled in the passes between the rolls as it goes forward, and is then passed back to its first position over the top roll, to receive its second reduction as it again goes forward — work being done on the bar only on the forward trip; (2) the «two-high reversing» mill, two rolls high, but the motion reversible, so that after the bar has gone through on its forward trip the motion of the rolls is reversed, and the bar returns to the former position through another pass — work being done on the bar in both its directions of travel; (3) the «three-high» mill, in which there are three rolls, one above another, the bar going forward between the bottom and middle rolls, and returning between the middle and top rolls; (4) the «rocking mill,» consisting of two pairs of rolls set in a housing shaped in the sector of a circle in such fashion that the housing may be rocked to and fro, bringing alternately one pair of rolls and then the other into position. The bar is run through one pair as it goes forward, the mill is rocked back and the bar returns through the other pair, the power working continuously in one direction. See Fig. 2.

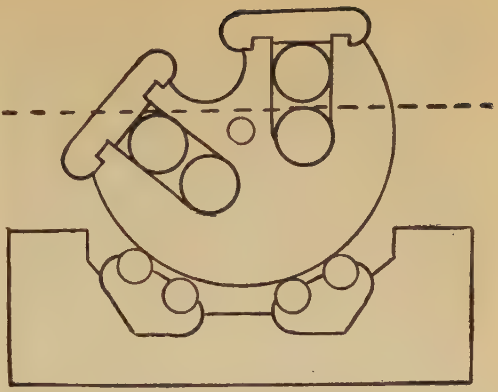
FIG. 2.— Rocking Bar Mill.

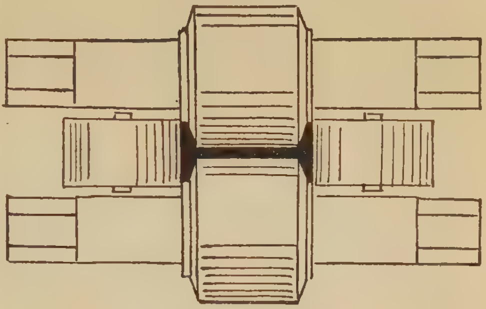
FIG. 3.— Grey Universal Mill. for I-beams.

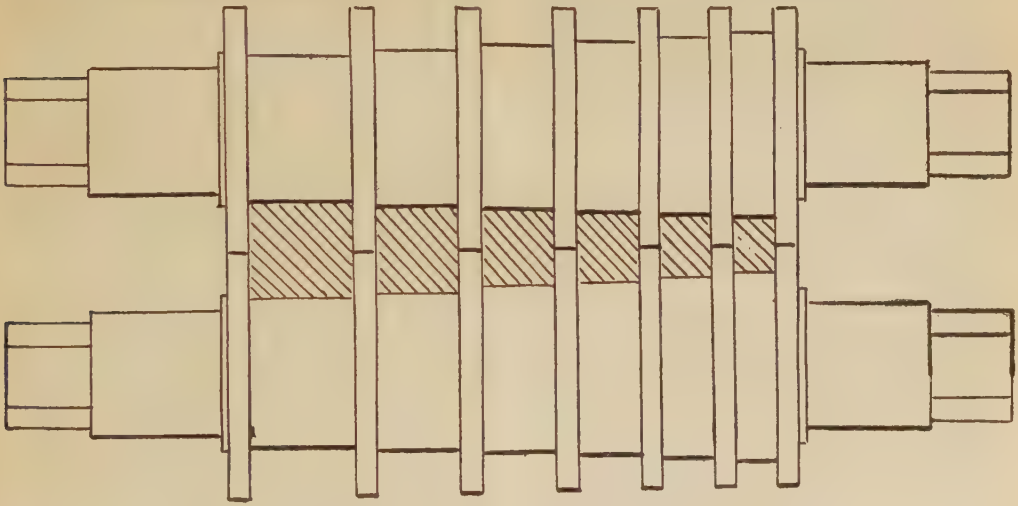
FIG. 1.—Two-High Cogging Mill; showing the reducing passes in shading.

The Universal Mill is a type of rolling mill with two horizontal rolls and two vertical rolls designed to turn out a finished product with one rolling. The Grey form of this mill is shown in Fig. 3. The passes are made of such shape as produce almost any dimensions of a given form. Two stands of rolls are used, one directly behind the other. The first gives the preliminary shaping and the second stand finishes.

The rolling mill establishments consist of a series or «train» of several mills. They are arranged according to the class of product turned out. In the «continuous» mill the sets of rolls are set one beyond another, and the metal being worked passes continuously in one direction, coming out at the further end of the works in a finished condition. The mills which make small rods and wire usually have their stacks of rolls set side by side in a rank. The bar coming from one pair of rolls is caught by the tongs of a workman and curved into a loop, passing back through the adjacent pair of rolls. Another workman catches it and directs it through the next mill in the rank, and thus the one rod may be passing through three or four pairs of rolls at the same time. This is called a «looping» mill. It is adapted only for work of small dimensions. The general purpose mill or «merchant» mill, as it is called, intended to do rolling or order, is generally a combination of the continuous mill and the loop mill.

Rolling mills are popularly classified by their ultimate product: as the blooming mill (making only the blooms for other mills), billet mill, hoop mill, wire mill, sheet mill, tube mill, etc. The products of rolling mills are of two descriptions, semi-finished and finished. To the first group belong blooms, slabs, billets and bars. To the second class belong rods, bands and hoops, structural shapes and rails, plates, sheets, skelp, nail plates, wheels, axles, tires, etc.

The rolls are driven by powerful steam engines, or by electric motors — the latter form of drive coming more and more into favor except for the heaviest work. In mills which run continuously in one direction the fly-wheel is universally in use to store energy when metal is not actually passing through the rolls. In the reversing type of mill the fly-wheel cannot be used, as the engine must be brought to a full stop and reversed with each pass. For this reason the engines to run reversing mills must be extremely powerful. The advantages of electric drive are: (1) economy due to the rapidity of action and high efficiency of all electric machinery at all loads from the lowest to the maximum; (2) reduced floor space; (3) ease of control; (4) uniform drive with a uniform current; (5) smaller initial cost. The motors are coupled direct to the mill, and the speed can be varied from 190 to 270 revolutions per minute. However, in sheet mills, where the speed is cut down to 30–35 revolutions per minute, direct coupling has been proved entirely satisfactory.

In the manufacture of rails, the ingot of cast metal is placed in the soaking pit and heated to a white heat. It is then taken to the blooming mill and passed through the blooming rolls seven times and reduced to a bar of a section nine inches square and 15 feet long which is subsequently sheared into two or three pieces, according to the length of the desired rail. These pieces called «blooms» are then heated in the bloom furnaces from which they are taken to the rail mill, which consists of a series of grooved rollers arranged in three sets — the roughing rolls, the intermediate rolls and the finishing rolls. These rolls are placed one beyond the other and extend over an interval of about 900 feet. The hot blooms are passed through them successively. Through the roughing mill the bloom is passed five times and reduced approximately to the section of the desired rail. It is then passed through the intermediate rolls five times and brought still closer to the desired section. It is now placed upon a cooling table for a period of time ranging from 45 to 90 seconds, depending upon the weight per pound of the rail, and then passed through the finishing rolls and brought to the exact section required. After leaving the finishing rolls the rails are cut into lengths of 30 to 60 feet, as required, then passed through the cambering rolls where they receive sufficient camber to ensure of their remaining true and straight when cooled. Rail rolling mills have a capacity of turning out from 7,000 to 8,000 rails per day, requiring about 3,000 tons of metal. See RAILS, MANUFACTURE OF.

The largest rolling mill in the world is that recently completed for the Lukens Iron and Steel Company of Coatesville, Pa. It is 204 inches in width, capable of rolling plates up to 192 inches (16 feet) in width. In pattern it is a four-high mill, the two middle rolls being the working rolls and the top and bottom rolls being merely backing-rolls, running in contact with the working rolls to stiffen them against bending. The working rolls are of a chilled iron 34 inches in diameter and the backing rolls are of cast steel 50 inches in diameter. The mill is of the reversing type and the rolls of the «balanced» order, the screw-down rig being operated by two 150-horse-power motors. The rolls are driven by a 46-inch by 70-inch by 60-inch twin tandem compound condensing steam engine.

The normal production of rolled steel in the United States is best assessed from the output of the year 1914, many of the mills since then having been given over to the making of munitions. In that year the product was 3,500,000 tons of rails; 3,000,000 tons of plates; 3,000,000 tons of sheets; 2,500,000 tons of wire rods; 2,500,000 tons of structural shapes; 1,000,000 tons of skelp; 1,000,000 tons of miscellaneous; 8,000,000 tons of merchant mill products — a grand total of 24,500,000 tons. (See PIPE, MANUFACTURE OF, and WIRE, MANUFACTURE OF). Consult Charnock, G. F., 'Mechanical Technology' (London 1915); Harbord, F. W., and Hall, J. W., 'The Metallurgy of Steel' (2 vols., New York 1916); Kindl, F. H., 'The Rolling Mill Industry' (Cleveland, Ohio, 1913); Association of Iron and Steel Electrical Engineers, 'Proceedings 11th Annual Convention' (Philadelphia 1917).

**ROLLINS**, rŏl'ĭnz, **Frank West**, American politician: b. Concord, N. H., 24 Feb. 1860; d. 27 Oct. 1915. He was graduated from the Massachusetts Institute of Technology in 1881 and later attended the Harvard Law School. After a brief practice of the law he became a banker in Boston. In 1894 he was elected to the New Hampshire senate and in 1898 was elected governor of that State. In this capacity he served two years. The idea of «Old Home Week,» established in New Hampshire during his administration, and adopted by many of the other States, originated with Governor Rollins. He published 'The Ring in the Cliff' (1877); 'Break o' Day Tales' (1895); 'The Lady of the Violets' (1898); 'Old Home Week Speeches' (1900), etc.

**ROLLINS COLLEGE**, located at Winter Park, Fla.; established in 1885. It is not under direct denominational control, but is closely affiliated with the Congregationalists. It has a collegiate and preparatory department, the former conferring the degree of bachelor of arts. It is coeducational and the number of women in attendance usually nearly equals the number of men. The grounds and buildings in 1923 were valued at about $500,000; the library contained over 8,000 volumes; the annual income was $129,000. The students numbered 350 in both departments and the faculty 32.

**ROLLO,** rōl'ō, Norwegian conqueror of Normandy: d. 930. According to tradition he was named «Walking Rolf» (Ganger Rolf), because no steed could carry him. He fought for several years in France and finally made peace in 912, receiving from Charles the Simple for himself and his freebooting followers a tract along the Seine between the Eure and Epte. He became a Christian, was baptised at Rouen and took the title Duke Robert. See NORMANS.

**ROLPH, John,** Canadian politician and physician: b. Thornbury, England, 4 March 1793; d. Toronto, 10 Oct. 1870. He studied law and medicine, emigrated to Canada in 1820 and in 1821 was called to the bar. He engaged in law practice and later also practised medicine. He was elected to the assembly of Upper Canada in 1825; and for a time in 1836 was a member of the executive council. With W. L. Mackenzie he planned the insurrection of 1837 and upon its failure sought safety first in the United States and then in Russia. After the amnesty of 1843 he returned to Canada and in 1845 he was elected to the Canadian Parliament. He retired from politics in 1857. He afterward devoted himself to the practice of medicine and founded the Peoples' School of Medicine, which later became a faculty of the University of Toronto. Consult Dent, J. C., ‹Canadian Portrait Gallery› (1880); Lindsey's ‹Life and Times of W. L. Mackenzie.›

**ROMAGNOSI,** rō-man-yo'se, **Giovanni Domenico,** Italian jurist and philosopher: b. Salso Maggiore, Italy, 13 Dec. 1761; d. Corfu, 8 June 1835. He was educated at Pavia and established himself as an advocate at Trent. He was appointed professor of law at Parma in 1803 and in 1806 went to Milan to assist in preparing a code of penal procedure which was later adopted. A chair of law was established expressly for him at Milan, but after the downfall of Napoleon he lost his position. He continued to lecture until 1817 and in 1818 was tried for treason but acquitted. He subsequently supported himself by giving private lessons and continued in abject poverty until his death. Among his works are ‹La genesi del diretto penate› (1791); ‹Introduzione allo studio del diretto pubblico universale› (2 vols., 1805), etc. Complete editions of his works were published in 19 volumes (1832–35) and in 15 volumes (1836–45).

**ROMAIC LITERATURE.** Already some centuries before ancient Greek declined and became extinct there existed a dialect among the common people which gradually replaced the majestic tongue of Hellas. Until about the middle of the 18th century this dialect, out of which grew the Romaic or Neo-Hellenic, degenerated in form and became split up into various other dialects. During the Turkish dominion Greek pride of race was kept alive by dwelling on past glories. With the dawn of independence efforts were made to revive those glories. Ancient authors were studied, ancient names were given to their children, and literary men endeavored to graft the ancient language on to the modern. In the first newspapers which appeared there began an artificial process of grammatical reconstruction that led to curious and confusing results. Ancient Greek accidence and words were intertwined with modern French syntax, and a «literary» dialect arose, a language of books that grew quite distinct from the language of the people. Unfortunately no Greek Chaucer or Dante appeared to crystalize the incongruities and dialects into a fixed language for both the written and the spoken word. But for centuries there had been in continuous use among exiled Greeks a literary language lineally descended from the Byzantines, and which could be read and understood by all educated Greeks. At first limited to a small circle, this literary language gradually made its way during the 19th century as a spoken speech among the people — a speech commonly called Romaic, but a form of Byzantine Greek. Educated Greeks speak in the general dialect except with those to whom some ceremony must be used. For many years the Greeks have been purging their language of Turkish and Italian words, so that newspapers are now written almost in the style of classical writers.

Ptochoprodromos or Prodromos, who flourished about 1150 A.D., is the first Romaic author of whom there is definite record. He left two long Romaic poems addressed to the Emperor Manuel Comnenus. To the early 14th century belongs a metrical ‹Chronicle of the Conquest of the Morea.› Folksongs especially composed the most widely cultivated form of literature in the heroic «Klepht» songs, though their literary quality is not very high (see KLEPHTS). Among the mass of Romaic literature that emanated from Greece, Constantinople and the islands of the eastern Mediterranean after 1453, there were but few works of importance, notwithstanding the wide range of historical and theological prose, allegorical and erotic poetry, mystery plays and spiritual hymns. The most celebrated compositions before 1800 are ‹Abraham's Sacrifice,› a 16th century mystery play; the chivalric romance, ‹Erotocritus,› by Vicentius Cornaro who has been styled the modern Homer;' and the gruesome drama ‹Erophile,› by Chortakis, adapted from the Italian. A revival of enthusiasm for education and literature occurred in the 18th century; Bucharest and Jassy became centres of Hellenic culture, which later found a seat at the University of Corfu, founded by Lord Guildford in 1808. Rhigas of Velestinos (d. 1798), inspired by the French Revolution, aroused the patriotic ardor of his compatriots for liberty. He wrote the war song, ‹On, Sons of the Hellenes!› — which has been called the Greek ‹Marseillaise.› Joannes Velaras of Epirus (d. 1823) was a doctor by profession and a writer of satirical fables. With the emancipation of Greece in 1821 several men of genius were connected, notably the brothers Panagiotis and Alexandro Svotsos, and Alexandro Rangabé. The first two heartened the people in the struggle for independence with lofty ideals and in eloquent language. Rangabé (Rangavis), though chiefly remembered as a poet, covered a wider field of literature, His works comprise songs, hymns, ballads, narrative poems, comedies and tragedies. Adamantios Koraïs (1748–1833) deserves a high place in Romaic literature; he was one of the early reformers in the long-drawn-out controversy over the ancient and the «vulgar» Greek. Dyonisius Solomos (1798–1857) wrote the Greek national anthem, the ‹Hymn to Freedom,› and a number of powerful dramatic poems, including one on the death of Byron. Of the later writers Valaoritis of Corcyra (1824–79) is the most notable, both as poet and an artist in his craft. His thoughts are expressed in the language of the peasantry, refined and uplifted. Other celebrated poets are Julius Typaldos (1814–83) and Markoras of Corfu; Demetrios Bikelos, who translated some of Shakespeare's plays; the Anacreontic Christopulos; Georgios Soures, a witty and versatile journalist and poet. Among the best colloquial story writers are Palamas, Karkavitsa and Eftaliotis. These have preserved the pure dialect of the people and valuable pictures of modern peasant life. Axiotes and the Cretan Damverges are racy in dialogue when their characters converse, but in their own persons they use a rather stilted and conventional style. Between 1892 and 1900, M. Pallis issued a translation into modern Greek of the first half of the ‹Iliad.› Although the form of the modern sentence differs widedly from the ancient, yet owing to the simplicity of Homer's style, Pallis keeps surprisingly close to his model. Quite a number of Greek authors compose their works in French, German or English, thus reaching a wider circle of readers.

The struggle between ancient and modern Greek assumed an alarming shape on 21 Nov. 1901 when a meeting of 10,000 people held in the temple of Jupiter at Athens protested against the proposed issue of a translation of the Gospel into the popular language, Romaic. The meeting was broken up by troops and some 20 persons were killed or injured. The translation had been made by the queen's order, but the students of the university objected to it on the ground that the original text was sacred and should not be tampered with, and that if the Gospels were promulgated in the kingdom in the dialect spoken there the feeling of Pan-Hellenism might be weakened, as a different dialect was spoken by the Greeks in Turkey.

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**ROMAIKA** (rō-mā'ĭ-kạ) **DANCE.** See Pyrrhic Dance.

**ROMAINE,** rō-mān', **William,** English Anglican divine: b. Hartlepool, England, 25 Sept. 1714; d. London, 26 July 1795. He was educated at Oxford, held several small curacies prior to 1748, when he went to London to hold a lectureship at the united parishes of Saint George's, Botolph lane, and Saint Botolph's, Billingsgate. In 1749 he became attached to Saint Dunstan's-in-the-West and the next year became morning preacher at Saint George's, Hanover square. He was a follower of Whitefield, an ardent evangelical and suffered much persecution in and out of the Church for his views and on account of the congregations of the poor that he assembled. As a consequence he lost his appointments and held others but for a brief period until 1764, when he was inducted into Saint Ann's, Blackfriars, and was elected by the parishioners to Saint Andrew of the Wardrobe. This election, though disputed, was confirmed by the Court of Chancery and he held the pulpit until his death. He published ‹The Life of Faith› (1763); ‹The Walk of Faith› (1771); ‹The Triumph of Faith› (1794).

**ROMAN, André Bienvenu,** American governor: b. Opelousas, La., 5 March 1795; d. New Orleans, La., 26 Jan. 1866. He came of French stock, was graduated at Saint Mary's College, Maryland, in 1815, and became a sugar planter in Saint James' Parish. He was for many years a member of the State legislature, serving as speaker of the lower house for four terms, and in 1826–28 he was also judge of Saint James Parish. He was governor of Louisiana in 1831–35 and in 1839–41; and aided the foundation of Jefferson College and the drainage of the swamps around New Orleans. He was a Whig in politics and opposed disunion, but in the Secession Convention of 1861 voted for secession when the crisis was reached. He was one of a Confederate commission of three to approach the government at Washington to seek a peaceable separation from the Union.

**ROMAN DE LA VIOLETTE** (Fr. ‹Romance of the Violet›), a French poem written by Gerbert Montreuil about 1225–30. It contains about 6,700 rhymed lines and exists in four known manuscript copies of different periods, of which two are in the Bibliothèque Nationale, Paris; one in the Imperial Library, Petrograd; and one in the private collection of J. E. Kerr, New York. Its heroine is the victim of a wager concerning her virtue, but triumphs over slander and proves her innocence. The story is used in ‹Roman du Comte de Poitiers›; ‹Floire et Jeanne›; in the ‹Decameron›; Shakespeare's ‹Cymbeline›; Weber's ‹Euryanthe,› etc. It was published by Francisque Mihel in 1834. Consult Buffum, D. L., ‹Le Roman de la Violette› (1904).

**ROMAN ARCHÆOLOGY.** See Catacombs, Roman; Christian Archæology; Italy—Archæology; Rome.

**ROMAN ARCHITECTURE.** See Architecture.

**ROMAN ART.** See Italy — Art in Ancient Italy.

**ROMAN CANDLE.** See PROJECTILES.

**ROMAN CATACOMBS.** See CATACOMBS.

**ROMAN CATHOLIC CHURCH.** See CATHOLIC CHURCH.

**ROMAN CATHOLIC EDUCATION.** See EDUCATION, ROMAN CATHOLIC.

**ROMAN CATHOLIC EMANCIPATION,** the abolition of those civil and ecclesiastical restraints to which the Roman Catholics of Great Britain, and particularly of Ireland, were once subjected. By the statutes of William III, Roman Catholics were forbidden to hold property in land and their spiritual instructors were open to the penalties of felony; and although latterly these restrictions had not been enforced, they remained unrepealed in England until 1778. See EMANCIPATION, CATHOLIC.

**ROMAN EMPIRE.** See ROME.

**ROMAN EMPIRE, Holy.** See HOLY ROMAN EMPIRE.

**ROMAN FORUM.** See FORUM; ROME.

**ROMAN LAW.** See CIVIL LAW; JUSTINIAN; PANDECTS.

**ROMAN LITERATURE.** See LATIN LANGUAGE; LATIN LITERATURE.

**ROMAN NOSE,** a Cheyenne Indian who operated along the Kansas border from 1864 to 1868. He was a brave and daring leader of a resourceful nature and much feared on that account. In 1866 the whites began to push into the country of the Cheyenne and a railway was being extended through it. The Cheyenne protested. A meeting or council to hear the protest was held at Fort Ellsworth, Kansas, in which General Palmer and the leaders of the Indians took part. At this council Roman Nose presented the claims of the Cheyenne in a concise and forceful manner. The Cheyenne not only protested against the invasion of their territory but they were determined to defend it. Almost immediately the Indians were upon the warpath under Roman Nose and Black Kettle; and they became a terror to western Kansas all along the line of the Kansas Pacific Railroad. Everywhere the isolated homes of settlers were attacked and the inhabitants massacred. General Sheridan, military commander of the district, organized from among the more daring settlers a band of 52 so-called scouts and placed them under the command of Major Forsyth. On 10 Sept. 1868 they came upon the trail of a large band of Indians whom they later encountered on the 17th at Beecher's Island in the Arikaree Fork of the Republican River. There the whites, finding themselves surrounded and outnumbered 20 to 1, retreated to the island where they defended themselves for eight days without food and without horses, the latter having been killed. Roman Nose planned the attack of the island from one side by 500 warriors while he prepared for a cavalry attack with 500 from the opposite side. This latter he led personally in a wild charge which forded the river, reached the island and rode up to the breastworks of the whites who defended themselves steadily and systematically. At the breastworks Roman Nose fell and the Indians broke and fled. But they reorganized and made two more desperate attacks upon the island only to be repulsed with still greater slaughter. Finally the siege was broken by the arrival of a part of the 10th cavalry from Fort Wallace, Kansas. Consult Hodge, 'Handbook of American Indians' (Washington 1910); Johnston, H. L., 'Famous Indian Chiefs' (Boston 1909).

**ROMAN RELIGION.** From the time that the Roman religion appears within the pale of traditional and recorded history it seems to have been constantly and progressively subjected to varying influences, both internal and external, and to have passed through many changes. For this reason different writers have had very different views as to what it really was, according as each took his vantage position at this or that point of its evolution. The religious system of the Roman Empire was distinctly different from that of the Romans when they first appeared in Italy. The long and eventful intervening period of time had as effectively changed the composition of the Roman religion as it had that of the Roman people and Roman society. Therefore, any account of the religious life of Rome should explain these constant changes, reveal their causes and show the effects they had upon Roman society and upon that of all the peoples who came closely and intimately into contact with the Imperial City. Fundamentally the primitive religious ideas of all the Indo-European peoples were quite similar. Even the Roman religion, in the days when Rome was governed by kings and had already begun to evolve complicated rituals and complex myths, still retained a suggestive similarity to that of India. Yet striking though this similarity is the difference between the two religions is just as striking. This is due to the fact that, though the religious beliefs of the two peoples had the same origin, they had continued for centuries to develop independent of one another, after the separation in prehistorical times of the two great branches of the family. In the days of her struggles and later, of her achieved greatness, Rome strongly influenced the people with whom she came in contact, and was, in her turn, influenced by them. These influences extended from the Roman colonies in Spain and Gaul in the West to the Far East. Of these influences the strongest were those of Greece, Egypt and Asia Minor. Out of this constantly acting and reacting religious thought grew an all-pervading mysticism and love of philosophical speculation.

**Early Period.**— Originally the Roman religion was almost altogether nature worship vivified by a primitive belief in an all-pervading and prevailing animism. Survivals of this faith in the religion of Rome at a later period in her history point indisputably to the fact that the Romans were at one time nomadic and given largely, if not altogether, to hunting and fishing, and that their deities and familiar spirits partook of the nature of these occupations. In their nomadic and hunting days the Roman people built no temples and apparently erected no religious monuments. They worshipped the gods of the chase and other beneficent or feared spirits in the haunts of nature, the sacred groves in the forest, by the sides of flowing streams and on the tops of hills and mountains. The early Roman gods were the personification of the elements of nature. The old

Roman deities and supernatural beings of their nomadic life, the patrons of the chase and the guardian spirits of the mountains, the rivers, the earth, the sky and the upper heavens gradually assumed more definite attributes and became, at the same time, confined to a more restricted atmosphere as the Romans settled down to a sedentary life and became agricultural and later on commercial. But being the first on the scene these earlier gods, for the most part, continued to develop and to assume these new attributes in conformity with the natural growth of the city and the civic progress of its people, developing finally into the chief deities of a highly organized community. This evolution was in the full process of accomplishment when Rome became subject to strong and steadily increasing influences. This development of the primitive Roman deities and the influence of outside religious forces were recognized by the Romans at a later period, when they classified their deities as *di indigentes* and *di novensides* or *novensiles,* that is, the native gods and the foreign or new gods, the latter of whom were introduced from the other tribes of Italy, and at a later period from Greece and other countries with whom Rome had come into intimate political contact. Each of these gods, old and new, had his distinct ritual, place and relationship in national life.

Rome, founded, according to tradition, as a free community, threw her gates open to the oppressed and discontented of the surrounding country. This liberality of thought and attitude on the threshold of her career distinguished her ever afterward and enabled her to assimilate, first, all of Italy, and afterward vast domains outside the Italic Peninsula. The deities and religious customs and practices of all the tribes of Italy of Indo-European origin, which were quite similar, gradually became domesticated in Rome. Naturally as the Roman Empire broadened and became more cosmopolitan, its religious system also became broader and more all-embracing. Having absorbed the deities of the Italic Peninsula, the habit of absorption became, with Rome, all-impelling, and the pantheon of the Imperial City, reaching out its octopus arms in every direction throughout the already wide confines of the rapidly extending Roman domain, and even beyond it, brought new creeds, new deities and new religious philosophies into Rome. Under such conditions as these little or no religious dogma could exist; nor did it. On the contrary, religious Rome was like a vast, all-absorbing sponge drawing into itself all that came within its sphere of action, religious creeds, ideas, customs, philosphies, elaborate theories and mystical speculations, with their corresponding practices, rituals, ceremonies and public celebrations. Thus ecclesiastical Rome became as cosmopolitan and eclectic as the Roman Empire itself. This is but another way of saying, however, that the religious life of the Roman community was constantly shifting as the process of broadening continued.

**Evolution of the Gods.**— In the early Roman gods, which, as we have already seen, consisted for the most part of guardian deities of hunting, fishing, fighting and all the practical needs of daily life, were the seed germs from which sprang the national state religion under the early kings and the mighty gods of later imperial Rome, with their magnificent temples, shrines and extensive and highly organized priesthood and other ecclesiastical dignitaries, their close connection with the state and their inseparable partnership with the imperial family. The first temples built in Greece and Rome were suggestive of their origin. They consisted of rows of pillars of wood so erected as to imitate or represent the sacred groves of the forest. Diana, the moon goddess, under one name or another and with somewhat varying attributes, the favorite deity of so many nomadic peoples given to the chase, and in all probability the chief deity of the nomadic Romans, gave place to the earth mother, the producer, the characteristic deity of an agricultural people. The agricultural Romans created a new relationship between the heavens which sent the refreshing and invigorating rains and mist upon the earth and the great earth mother who received them; and they made the sky and the great earth, on account of this relationship, husband and wife, father and mother. But the moon goddess did not thereby lose all her ancient power and glory. She still remained what she had always been, distinctively the patroness of the hunters and of all persons taking long journeys. Connected from early times with the primitive priests she continued to be intimately connected with the diviners and soothsayers, and later on, with the alchemists and astrologers, their first cousins.

In the meantime Jupiter, the god of the sky, of the upper regions and of thunder, usurped the foremost place primitively held by Diana, the moon mother, becoming the titular deity of the Romans and the supreme god of the Latin races united under the imperial sway of Rome. Originally, as his powers, functions, titles and attributes indicate, he was the chief active, divine spirit of the heavens, a being to be feared and propitiated by a nomadic people, but one of no other very great interest to them. But though Jupiter grew to be the greatest of the Roman gods and was affectionately designated the All-father, yet he preserved to the last all the primitive earmarks of his nature origin. He was generally represented with the thunderbolts in his hand (the sign of his dominion over the elements), and the eagle (the thunder bird) by his throne. As the god of the dawn he was «the white one»; and in general everything connected with his worship was white. Even the consuls dressed in white when they sacrificed to him in their official capacity, and his priests wore white caps symbolical of the color sacred to him as representing the light of day, or more properly of the dawn or coming day. For the same reason white animals were offered to him in sacrifice.

Jupiter not only attracted to himself the attributes and qualities of other deities with many of their functions, but he also showed a signal power of extending all these acquired functions and, in a sense, organizing them into a component part of the system of state religion. One of the strangest of these developments is that of Juno, the female counterpart of the supreme deity himself, and the definition of the supposed female qualities of the sky. In other words she is but a subdivision of

Jupiter himself, whose sister and wife she is represented, in Roman mythology, to be. She bore the same relation to women that Jupiter did to men. She was the special protectress of women throughout life and she presided at birth, marriage and death, being ever the tutelar female genius, and by extension the guardian of national finances, as the Roman wife was of the household finances.

Next to Jupiter and Juno, his regal consort, the greatest of the Roman state gods was Mars, who, beginning as a deity of agriculture, as the Romans emerged from barbarism grew more and more the patron of war, as Jupiter's warlike functions and attributes became obscured in his assumption of the throne of the Roman pantheon. Yet as Jupiter never altogether outgrew his warlike associations so Mars never got completely away from his earlier agricultural connection. Jupiter, with Mars and Quirinus, formed the great triad of gods of the earlier state religion of Rome. The latter, who was the Colline deity of war, became the patron of soldiers and other armed people in times of peace; while Mars, who was especially honored in March and October, was the patron of the opening and closing of the war campaigns and of the sports connected therewith. Thus, in the readjustment of religious ideas, customs and practices, after Rome had extended her sway over all of Italy, the functions and attributes of the tribal deities became more and more specialized, each god, however, in the shifting of the scenes, retaining his most characteristic part and attributes. Thus Janus, the doorkeeper, who is usually associated with Vesta, the keeper of the hearth, came, through a natural process of evolution, to preside over the beginnings of all undertakings. He was represented as having two faces, that he might see the more readily the beginning and the end of all things. He carried a staff (symbolical of traveling) and a key (the sign of his functions as doorkeeper).

Probably none of the greater of the Roman gods exemplifies better than Vesta the ever-changing character of the Roman deities. Originally the Roman virgin goddess of the blazing hearth, she was worshipped along with the Penates, at every meal when the family assembled round the hearth, which was situated in the centre of the room. Under the organized Roman state religion Vesta became symbolically the king's hearth, that is, the hearth of the nation, and as such she had a sumptuous temple near the king's palace. The vestal maidens belonging to this temple were known as the king's daughters, a title that was later on extended to the vestal maidens of all of Vesta's temples. According to the religious legend, Æneas was credited with having brought with him from Troy to Rome the sacred fire of the vestal temple on the Forum, where it was guarded with the most solicitous religious care by four (later six) virgins of the purest character, called vestals, who were dedicated to the service of Vesta from an early age (6 to 10 years) for 30 years, after which they were, by law, permitted to marry. Few, however, took advantage of this permission, even though it was considered a great honor to marry a vestal, upon whom rested the special favor of the goddess of the hearth. This was because the office of vestal was considered one of special ecclesiastical dignity and honor and carried with it a certain influence.

**Naming the Deities.**— In general the Roman gods were named from their qualities, functions or actions. Often the primitive sense of the name is exemplified in the future actions of the deity. One of the best examples of this is Ceres (Greek *Demeter* from Gemeter, *ge,* the earth, and *meter,* mother), the goddess of the earth, the bringer forth of fruit and the special patroness of growing grain and other plants. Though a Roman deity, she was said to have been the daughter of the Greek deity Kronos and his sister-wife, Rhea. The Romans early identified Kronos with their own agricultural deity Saturn, an ancient Italian god of the culture hero type whom tradition represents as having made his appearance in the reign of Janus and to have taught the Roman people the arts of civilization and especially agriculture and gardening. He is said to have become coruler with Janus, and later poets sang of their rule as the «golden age.» His temple was in the state treasury, because he was represented to be the special patron of wealth. A female derivative of himself and his functions and attributes was his wife, Ops, the female divinity of fertility and plenty and the protectress of agriculture. Thus it will be seen that her functions largely overlapped those of Ceres. The latter, whose distinguishing symbols were full and flowing robes, poppies and ears of corn and who wore a corn measure for a headdress, was the mother of Proserpine, the queen of the under-earth regions, and of Bacchus, the god of the vine and of wine, its characteristic product. The origin of most of the other gods is as distinctly pictured in their names. The Lares, the spirits of deceased ancestors, were literally «the shining ones»; Ops denoted the plentiful harvest; Pomona fruit; Saturn the sowing of the seed; Vesta the glowing hearth; Ge the earth. Kronos, the oldest of the great gods, has come to signify time, if he did not originally do so; while the Penates, the gods of the interior of the houses, mean literally those within (*penitus,* within).

**Ceremonies.**— The Roman religion was distinctly ceremonial, and in this it betrays its nature worship origin. It possessed ceremonies for every event in life, and for almost every conscious movement of existence. Birth, infancy, puberty, marriage and death were all celebrated with elaborate and significant ceremonials. Each stage of the year, the days of the week, the progress of agricultural development, the special occupations of the individual, the successive seasons of the year, the family meal, all had their individual and appropriate ceremonies at certain fixed times. These ceremonies, taken as a whole, represent the sum total of man's interests, faculties and powers, the whole inventory of which they covered, by anticipation, in the act of accomplishment or in fulfilment. The calendar year which began in March, for instance, was divided religiously into three seasons, spring, harvest and winter, to each of which was apportioned its appropriate and individual ceremonies. In spring anticipatory prayers were offered for the successful growth of the seed already planted; in the harvest season ceremonies were held in connection with the gathering and storing of the harvest; while the winter ceremonies were directly related to the preparation of the ground for planting and the sowing of the seed. The elaborate ceremonies connected with these three seasons of the year grew into great national religious events famous in the life of the Roman people, both in the Imperial City and throughout the towns of the empire. So strongly had they become a part of the lives of the people after the debâcle of time had swept away the Roman faith, and after it the Roman Empire, that they remained standing forth from amidst the ruins, to influence largely the Christian festivals and calendar. There were scores of other characteristic Roman religious ceremonies covering the deference, devotion and offerings made to the great deities of the state religion and also those presented to the minor deities and personal and household guardian spirits. Most of these may be found described in any work on the subject under the name of each of the deities and spirits.

The medicine-man, conjurer, enchanter and worker of great magic inseparable from the religious ceremonies of primitive races had already developed into the formal priest when the Romans first appeared upon the stage of history in Italy. At this early period Rome seems to have also possessed her own religious rituals and sacred priestly knowledge. The priests soon became the first depositaries of writing and the organizers of the calendar and the religious tribal and state religious ceremonies in general. At this early period in the life of the Roman people, the superior priesthood seem to have been almost inseparably connected with the nobility and the kingly rulers, the latter of whom had already begun to lay claim to descent from the gods. The seeds of ancestor worship had also already been planted, a custom which was later on to deify kings and emperors, as the legal and de facto representatives of the gods upon earth. As early as 304 B.C. the first known religious ceremonial Roman calendar presents a list of 45 days in the year sacred to the gods and subject to prescribed ceremonial. No work was permitted on these days. Following this first ceremonial regulation and the Julian calendars, (46 B.C.) there were some 30 other calendars, all issued with the same end in view, the recording and regulating of religious practices and ceremonies long in vogue. For this reason, though most of these calendars are fragmentary, they are of very great interest and value in the study of the religious and social life of the Roman people. They show plainly the organizing hand of a priesthood growing steadily ever more and more powerful, better organized and more closely connected with the state. According to the calendars, 30 or more gods were signally honored in the provision of special festivals, ceremonies, shrines and priests; and of all these definite and well-defined deities and ceremonies statements are presented which are invaluable for the proper understanding of the religious references so profusely scattered throughout Latin literature.

**Evolution of Religious Thought.**— Rome had about all the various and varying religious experiences sustained by later nations and peoples. In the early stages of her career she had a strong and abiding faith in her gods and in their efficacy. The establishment of the state control of religion was followed by a decrease of interest in religious matters by the more intelligent classes. From the end of the Regal Period to the Second Punic War Rome became gradually more cosmopolitan, assimilating the thought of the other parts of Italy in her almost continuously waged campaigns of war and commerce; and from the close of this latter period to the end of the republic, while working out her destiny as Imperial Rome, she came into contact with Greece and other highly-civilized nations; and her literature, thought and philosophy expanded and became truly national, assuming, at the same time, a world-wide outlook. This brought with it a radical revolution in religious thought leading directly to general scepticism. It looked very much as if the old religion were about to go by the board when the establishment of the empire saved it for the time being. The emperors, claiming to rule by divine right and direct descent from the gods, it was very much to their interest to uphold a state religion; which they did on a magnificent scale, bringing into the national church all the officers, employees and dependents of the government. The state church, at this latter stage, was an immense fraternity, all the members of which were bound, by virtue of their office, to support it. This revival of the ancient Roman religion was, therefore, less religious than political, though the royal family and especially the emperors took the matter serious enough, an attitude due to their careful education, which taught them to believe in their own divine birth and destiny. But on the whole this revival of the old faith was effected under conditions which could produce only a general scepticism; and this became the prevailing tone of the religious thought of the empire, which showed itself in the wide attention given to the most recondite philosophies, mysticisms and foreign cults of all kinds. Babylonian, Greek, Assyrian, Egyptian and Eastern religious ideas found welcome in Rome. The Great Earth Mother of Asia Minor and Isis, the mother goddess of Egypt, were not only introduced into Rome but their worship, which was accompanied with elaborate ritual and ceremonial, became almost universal throughout the Roman Empire; and such a firm root did it take among the masses of the Roman people and the Eastern nations under the domination of Rome that the early Christian missionaries found great difficulty in eradicating it.

One of the strongest of the Greek influences was exercised through the Sibylline Books, which introduced Greek gods, rituals, organizations, ceremonies and practices into Rome. Connected with these books was a very famous oracle who boldly recommended the introduction into Italy of foreign gods, especially those of Greek origin. As this cult became fashionable with the educated class, it spread rapidly throughout the cities of the Roman Empire. Greek gods were set up by the side of Roman, the new by the old; and the splendor and pomp of the ceremonies connected with the worship of both increased. Greek art and the wholesale manufacture of artistic statues of the deities followed. One of the recommendations of great moment of the Sibylline Books was that of the introduction of the Magna Mater (the Great Mother), which helped to largely strengthen the worship of the Earth Mother, already mentioned. This was followed, on the same recommendation, by the introduction of the Earth Mother, Ma, of Phrygia. All these had very emotional rites and attractive ceremonies similar, in many respects, to those accorded Isis of Egypt. Hence they appealed strongly to a people already tired of the dead formality of the old state religion which had become so ritualized and fossilized that it had lost all its former vitality and attractiveness. This craze for foreign deities went to unheard-of extremes, going so far afield as Persia, from which was introduced the great sun god, Mithras, with his elaborate mystical worship, which became very popular in the Imperial City itself. From thence it spread over all the Roman Empire, where Mithras was worshipped as the source of all life and the redeemer of souls. His mystical rites, which were held in dark caves or gloomy buildings under ground, were attractive owing to their contrast to the gorgeous ceremonies of the state religion, in which it was said that no one stil believed except the emperor and the poets; a hyperbole which conveyed the thought that it had become an integral part of the government machinery and of the imagery and machinery of Latin literature, which was overlarded with allusions to the state deities and given to fulsome praise of them, partly because this was pleasing to the state authorities. Thus Rome, bathed in philosophy, scepticism, mysticism, emotionalism and stoicism, with nothing solid to which to anchor, drifted upon the rocks of national religious shipwreck. In this condition she was found by the young and vigorous Christianity, which, throwing her weight strongly in the balance, won the day for the development of the Catholic faith.

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**ROMAN REPUBLIC.** See Republics; Rome.

**ROMAN DE LA ROSE, Le** (‘The Romance of the Rose’), a poem of nearly 23,000 verses, is the most notable and was for 300 years the most quoted and discussed French writing of the 13th century. More than 200 manuscripts of it have been classified; 18 editions were printed between 1481 and 1538; large parts were translated into English and Dutch in the 14th century; Chaucer used it freely in ‘The Canterbury Tales.’ The ‘Roman’ was begun by Guillaume de Lorris, in the style then fashionable of courtly, scholastic allegory, as an Art of Love and, incidentally, of polite behavior, for the use and pleasure of courtiers and their ladies. Under the form of a dream the Lover, aided by Courtesy, Sweet-Looks, Riches, Fair-Welcome and others, seeks possession of a Rose-bud, guarded by Danger, Shame, Evil-Tongue, Jealously and so on. Guillaume drew the spirit and substance of his allegory largely from Ovid's ‘Ars amatoria,’ Chapelain's ‘De arte honeste amandi’ and the writings of Chrétien de Troyes. His work was apparently almost ended at his death, sometime between 1225 and 1240. With a brief conclusion by an unknown hand it counted 4,669 verses. Some 40 years later Jean de Meun took up the narrative in quite different spirit and in 18,000 verses, introducing many new characters, chief among them Reason and Nature, embodied the results of very wide if superficial reading and of daring speculations, political, economic, social and moral, anticipating much in Rabelais, Montaigne and Voltaire. Guillaume was no mean scholar or poet. His allegorical characters show keen analysis. He has faint premonitions of the Renaissance. But Jean's work gave the ‘Roman’ its abiding interest for it pressed social questions even yet not fully answered. He was a Parisian bourgeois. The site of his house has been identified at 218 Faubourg Saint Jacques. Many other writings, didactic and philosophic, are attributed to him. His purpose in the ‘Roman’ was, he says, «wholly for instruction.» In digressions of 1,000 verses and more he seeks to apply Nature and Reason, that is, normal instinct and common-sense, in a thoroughly rationalistic spirit to the claims of royalty and nobility, to the origin of society and the ideas of the state, of justice, taxation and property, to the inequalities in the distribution of wealth and, with special and often quite misunderstood insistence, to the social position of women, their claim to equality as «free-born,» and the evil effect on their characters of marriage as it had been developed under mediæval institutions. This gives occasion for much dramatically lively and often bitter satire. He condemns celibacy. The mendicant orders, typified in False-Semblance, embodiment of slothful hypocrisy, are his peculiar abomination. Speeches put in the mouths of the Duenna, prototype of Chaucer's Wife of Bath, of False-Semblance, the Friend, Reason and Nature, principally in the later half of the ‘Roman,’ best reveal Jean's radicalism. He finds place, too, for scientific speculations on the illusions of the senses and even on dissociations of personality. Through all this the allegory winds a slender thread leading to a philosophy of living more emancipated from theology than possibly the author realized. A symbolic celebration of Love as the self-perpetuating force of Nature ends with the Rose-bud in full bloom. Some two-thirds of Jean's verses hark back to older writers, chiefly Boethius, Alain de Lille and Ovid. He uses also Abelard and Roger Bacon and cites with complacent pedantry a host of others. He thought himself loyal to the Church, but his temperament was practical, positive. Nature and her priest Genius, to whom more than a fifth of the whole poem falls, are the touchstones of his ethics and social philosophy, the real objects of his devotion.

The first scholarly edition of the ‹Roman,› by E. Langlois (Paris 1914–) is in course of publication. Méon's edition (4 vols., Paris 1814) was good for its time. Michel's (2 vols., Paris 1864) is convenient, Marteau's (5 vols., Orleans 1878–1900) better. Consult Langlois, E., ‹Origines et sources du Roman de la Rose› (Paris 1891); id., ‹Les Manuscrits du Roman de la Rose› (2 vols., Lille 1910), also Bourdillon, F. W., ‹The Early Editions of the Roman de la Rose› (London 1906); Ward, C. W., ‹The Epistles on the Roman de la Rose› (Chicago 1911); Guillon, F., ‹Jean Clopinel› (Paris 1903); Besant, W., ‹French Humorists› (London 1873). There is a good, not quite complete, translation by F. S. Ellis (3 vols., London 1900).

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**ROMAN WALLS,** four great walls built by the Romans in Great Britain. The first of these stretched from the Firth of Forth to the Firth of Clyde. It was built by Agricola in 80 A.D. In 83 he strengthened it by another wall, and in 139 Lollius Urbicus again built over the same ground, the wall being known as the wall of Antonius. These walls were built to keep back the northern barbarians, who in the form of Picts and Scots continuously menaced Roman rule in Britain. Hadrian, concluding that the walls of Agricola were insufficient for this purpose, built in the early part of the 2d century the famous wall that stretched between Newcastle on the Tyne and Solway. This wall, finished in 120 A.D., was 68 miles in length, and marked the northernmost limits of Roman territory in Britain after that date. It is known as the wall of Severus, since that ruler strengthened it in 209 by building a parallel wall a few yards above it. Few remains exist of any of these save the last which may still be easily traced. Consult Bruce, ‹Roman Walls› (1855); ‹An Account of the Roman Antiquities Preserved in the Museum at Chesters, Northumberland› (London 1903); Westscott, J. H., ‹The Roman Wall in Britain› (in *The Classical Weekly*, Vols. XVIII–XX, New York 1911).

**ROMANCE,** a fictitious narrative in prose or verse, the interest of which turns upon incidents either marvelous or uncommon. The name is derived from the class of languages in which such narratives in modern times were first widely known and circulated: these were the French, Italian and Spanish, called the Romance Languages (q.v.). The treatment here given must omit any extended mention of certain isolated romances in the later Greek. A well-known example of such is ‹Apollonius of Tyre,› at one time widely read in the west of Europe; transmitted to England, first probably in a Latin version, it was soon translated, and was employed by Shakespeare for the plot of ‹Pericles, Prince of Tyre.› Nor can the limits of the subject admit of discussion of some few Latin works sometimes classed as romances, such as the ‹Golden Ass› of Apuleius, of which use was made in ‹Don Quixote› and ‹Gil Blas.› For such, see articles on individual titles and authors, and the general articles on the Greek and Latin literatures. For general consideration the subject may be restricted to the Middle Ages. The finest of these romances still extant are of the 12th and 13th centuries. They may be divided into two classes — the popular epics (*chansons de geste*) chanted by the jongleurs and other strolling minstrels; and the more elaborate and artificial poems composed by trouvêres and recited before aristocratic audiences.

The materials of both classes were more ancient lays of celebrated heroes, mingled frequently, especially in the German romances, with pagan myths, together with long connecting passages composed by the minstrels themselves. Hence originated a series of epics grouped around some renowned hero, and forming a cycle of romance. To the first class belong the German heroic poems and the Carlovingian chansons; to the second the Arthurian legends.

Of the collection of the ancient German lays made by Charlemagne, nothing remains except perhaps the fragment of the alliterative Lay of Hildebrand, now in the Cassel Library. It is supposed to have been written in the 9th century or even earlier. All the other manuscripts of German heroic poems are of much later date; none of them are earlier than the 13th and most of them belong to the 14th or 15th centuries. Of the ‹Nibelungenlied› (q. v.) there are three copies belonging to the 13th century. In this epic Dietrich plays an important part; but the poems devoted to the simple Dietrich legend are only found in late transcripts or early printed editions, probably little later than the date of their actual composition. They represent, however, older lays, and these again still older, of equal or even greater antiquity by two centuries or more than the Cassel fragment. The language changed considerably in the course of these centuries, and the poems must have been entirely recast, rhyme being substituted for alliteration; but the change in the legend itself is immaterial. It can be traced in the Latin chronicles of the 10th and 11th centuries, and also by means of the ‹Vilkina Saga,› an Icelandic prose work of the 13th century. These poems, as well as others on similar subjects, range from a few hundred to several thousand lines in length. Some of them were modernized by Caspar von der Röhn, and inserted in his ‹Heldenbuch.› The completest collection is that in Heinrich von der Hagen's ‹Altdeutsche Heldenlieder› (1855). Another poem closely connected with the Nibelungenlied is the Latin epic of Walter of Aquitaine, attributed to Ekkehard I, abbot of Saint Gall, who died in 973, and is said to have written it as an exercise in his youth. It is obviously a translation from a German poem, and is found in several manuscripts, none of them perhaps older than the 12th century. The ‹Klage› (‹Lament›), said by W. Grimm and others to be a poem of the 12th century, forms a sort of conclusion to the great German epic; and another poem, ‹Biterolf,› is ascribed to the same unknown author. It extends to 13,000 lines, and contains a great number of daring adventures, in the course of which Dietrich encounters and vanquishes Siegfried. ‹Gudrun› is a fine epic of nearly 7,000 lines, and is of not much later date than the ‹Nibelungenlied.›

We can only mention the names of the poems which make up what has been called the Lombard sub-cycle, namely, ‹König Ruther,› ‹Wolf-dietrich’ (including ‘Hugdietrich’), and ‘Otnit,’ which latter furnishes the materials for the French poem ‘Huon de Bordeaux.’ Frederick Barbarossa was a great admirer of Charlemagne, and collected all the accredited records of that monarch. He patronized the minnesingers as the German representatives of the troubadours. At his great Mainz tournament were assembled not only the knights of Germany and France, but the poets also. Among those present was Heinrich von Veldeke, who imitated the ‘Roman d’Eneas’ in his ‘Eneit,’ an example quickly followed by the chief leading epic poets of Germany. Heinrich completed his poem at the Wartburg, the residence of Hermann, Landgrave of Thuringia; and many other translations, among others that of the ‘Roman de Troie,’ were executed there shortly afterward. Another guest of the landgrave’s was Wolfram von Eschenbach, author of ‘Parzival.’

The *chansons de geste* form an interesting body of literature. The oldest of them are of great length, consisting generally of 20,000, 30,000, or even as many as 56,000 lines, grouped in sets (*tirades*) of from 20 to 200 lines, all ending with the same assonantal rhyme. Up till the middle of the 12th century the lines were of 10 syllables, but lines of 12 syllables, ending in consonantal rhymes, were gradually substituted. The romances were sung to the sound of a kind of violin (*vielle*), played with a regular bow. Many of the minstrels (*jongleurs*) were poor, wandering on foot from village to village, singing in the alehouses, or at the public fairs and games; some were soldiers, such as Taillefer, who struck his first blow at Hastings. Later they became mere mountebanks. A number of them wrote their own chansons, while others bought them from their original authors, and adapted them to the taste of their audience. When a jongleur had thus procured a copy he took care to conceal it from his rivals. A few of such copies, little weather-beaten volumes, are still preserved, a noted example being the Oxford manuscript of the ‘Chanson de Roland.’ It was to the poets of northern and central France rather than to the troubadours of Provence that these poems were due. The *chansons de geste* are divided into three cycles — that relating to Charlemagne and his peers, the Arthurian and the classical. The more antique the Charlemagne romances are the more they are devoted to the emperor, who is represented more as a majestic king and valiant knight than as the statesman we recognize him in history to be; at times he is depicted as being easily duped, avaricious and capricious. Among such works are ‘Girard de Viane’; ‘Ferabras’ or ‘Fierabras’; and the ‘Chanson de Roland.’ The centre of the entire structure is the ‘Arthurian Cycle.’ In the lays of the Welsh bards, supposed to be as old as the 6th and 7th centuries, although no manuscript extant is of earlier date than the 12th century, Arthur and his companions are celebrated, but temperately, the element of the miraculous being absent. It is in the ‘Historia Britonum’ of Abbot Nennius (apparently written in Welsh in the 8th century, and translated into Latin afterward) that the legendary additions begin to develop. Of three or four centuries later date are the so-called ‘Armoric Collections’ of Walter, archdeacon of Oxford, from whom Geoffrey of Monmouth professes to translate, and in which the supernatural and marvelous elements largely prevail. The ‘History’ of Geoffrey was versified in French (1155–58) by Wace, a son of one of the Conqueror’s followers. The ‘Brut,’ as this metrical setting is called, contains about 15,300 eight-syllable lines, and adds a few details to the story of Arthur which do not seem, however, to have been Wace’s own invention. The work was translated into English, and further amplified, by Layamon, about 1204. The ‘Brut’ of Layamon is composed of nearly 32,250 alliterative lines, or rather half lines. One of the most prolific of the Arthurian poets is Chrétien de Troyes (born about 1140).

One of the finest of the early French Arthurian romances, ‘Tristan’ or ‘Tristram,’ was adapted by Gottfried of Strassburg, who left his ‘Tristan und Isolt’ slightly incomplete, about 1210. Other poems belonging to the cycle are the ‘Morte d’Arthur,’ a fine alliterative work of the 14th century; a Latin ‘Life’ of Merlin, in 1,529 hexameters, written about 1217; ‘Li Biaus Desconneus,’ a narrative of the adventures of Giglain, son of Gawain, written by Renauld de Beaujeu about 1200, and imitated by Wirnt von Gravenberg in his ‘Wigolais’ (about 1212). From France the Arthurian romance spread also into Provence, Spain, Italy and the Netherlands, and was again transplanted into England.

The last of the cycles are the *classical,* in which the subjects are Alexander the Great and the Trojan heroes. The materials for the Alexandrine poems were found in an old Greek romance, written in Alexandria between 100 and 300 A.D., and known as the ‘Pseudo-Callisthenes,’ which was long read as authentic history, and of which there is still extant two Latin abridgments belonging to the 9th and 10th centuries. The most important romance on this subject is ‘Le Romans d’Alizandre,’ written by Lambert li Tors and Alixandre de Bernay in the 12th century; it contains upward of 20,800 12-syllable lines. This was the chanson that established the whole sub-cycle, and first brought the Alexandrine line into vogue and gave it its name. It concludes with the testament of Alexander and the lamentations of his 12 peers. Many French poets continued the subject. (See separate articles on the personages and the works mentioned; also FICTION; and PROVENÇAL LITERATURE.) Consult Billings, A. H., ‘Guide to the Middle English Metrical Romances’ (New York 1901); Courthope, W. J., ‘The Connexion between Ancient and Modern Romance’ (Oxford 1911); Hurd, R., ‘Lectures on Chivalry and Romance’ (Oxford 1911); Ker, W. P., ‘Epic and Romance’ (London 1897); id., ‘Dark Ages’ (London 1904); Mason, E., ‘French Romances and Legends of the Twelfth Century’ (New York 1911); Morley, H., and Thomas, W. J., eds. ‘Early Prose Romances’ (London 1906); Paris, G., ‘La litterature française,, au moyen-âge’ (Paris 1890); Rennert, A. H., ‘Spanish Pastoral Romances’ (Philadelphia 1912); Saintsbury, G. E. B., ‘The Flourishing of Romance’ (London 1897); Spence, L., ed., ‘Dictionary of Mediæval Romance and Romance Writers’ (New York 1913); Wagner, W., ‘Romances and Epics of our Northern Ancestors’ (London 1906).

**ROMANCE LANGUAGES,** the languages derived from the Latin tongue. These languages are very largely Latin in vocabulary and grammatical structure. The Romance languages had their being in the territory included within the Roman Empire. But not all of this territory produced Latin tongues for the simple reason that not all of it had become so Latinized that the Roman language had become that of the masses of the people. Through the colonizing efforts of Spain, Portugal and France, the Romance languages have spread beyond their original habitat, especially to Central and South America, where they have become the official speech of over 80,000,000 people. Romance languages are also spoken in many of the West Indies and part of Canada.

Italy, in the days of the Roman Empire, was subject to strong dialect influences against which the literary tongue had constantly to struggle. Little by little these influences gained the upper hand and literary Latin began to lose its complex grammatical forms and to become more analytical in construction. The northern end of the Italian Peninsula was considerably influenced by the so-called barbarian invaders and the south was overrun by Greeks, Carthaginians, Phœnicians and other races. The downfall of Greece had brought to Rome thousands of Greek scholars and teachers, all of whom were forced to use the Latin tongue, in which many of them learned to write fluently. These Greek scholars had a very considerable influence upon the development of the Latin language. In the later days of the Roman Empire, German and other mercenaries were extensively employed in Italy and throughout the Latin domains and prominent and influential men from the provinces in France, Spain, Britain and other parts either paid long visits to Rome, or lived there with their families. The number of these foreigners resident in Rome alone was very great, so that the cosmopolitan centre, where three languages, Latin, Greek and Italian, seem to have been recognized by the authorities as early as the first half of the 1st century of the Christian era, for we are told that one of the Cæsars returning from a protracted and successful military campaign gave the customary popular festivities belonging to such an occasion, which, in this case, lasted a month. One part of these festivities consisted of dramatic entertainments open to the public and given in Latin, Italian and Greek. The suggestive part of this act is that the Greek colony in Rome, at this early date, was so strong and so influential as to demand official recognition at the hands of a returning conqueror seeking public favor. Quite as suggestive is the fact that the dialectic influence at work within the Imperial City had already become so strong as to demand recognition at the hands of the authorities. The popular speech must have already become very considerably differentiated from the literary tongue, since it was thought good politics to give public plays in the former. Out of the service of people from all over Italy, in the Roman army for many years, sprang a sort of common tongue that was very considerably different from Classical Latin. This bastard Latin was carried by the army to every country over which the arms of Rome triumphed. Thousands of Roman soldiers and other Italian colonists settled in the provinces and many of them intermarried with the natives. As the way to preferment everywhere throughout the Roman Empire could only be found through the acquirement of the Latin tongue, the study of Latin seems to have soon become popular in the provinces, where the speech of the Roman soldier was naturally much more prevalent than the Classical Latin of the literary men and the higher government officials. In this way the so-called Low Latin became domesticated in the provinces, where it seems to have been accepted everywhere as the most convenient medium of business transactions not only with the natives but also with the Roman colonists from the interior and south of Italy. This curious lingua franca, if it may be so called, seems to have continued its disintegrating influence upon the Classical Latin tongue, which rapidly lost most of its grammatical inflections and became analytical in form. This change must undoubtedly have assumed definite shape in the tongue of the masses some considerable time before we have any existing record of it in the shape of surviving documents written in the popular speech. It began early to influence literary or written Latin, and its iconoclastic hand is seen strongly in the Vulgate which has made many concessions to the popular speech; and in other Latin writings of the same and somewhat earlier and later periods.

While the Classical Latin tongue continued to disintegrate and to reshape itself as an analytical language on the Italian Peninsula, it was subject to still greater disintegrating influences in the provinces, where each native race impressed its racial and linguistic characteristics upon it. In fact these racial characteristics are noticeable in a striking degree in Italy itself where the tongue of the north is different from that of Rome and the west generally and both are radically different from that of the south and southwest and the adjacent coastal islands. In the provinces the new Latin tongues that grew out of the decaying Latin shaped themselves in accordance with the tribal influences brought to bear upon them. Italian naturally keeps closer to the Classical Latin than most of the other Romance tongues. Yet the various dialects of southern Italy shows a wide divergency from the Classical tongue. In Spain and Portugal, where the Latin occupation had most influenced the native population, the Latin vocabulary suffers less contraction than in France. Yet in Catalonia and the east coast of Spain, and in the Provençal districts of France, the tendency toward the suppression of unaccented vowels and word terminations is very noticeable. All this indicates that strong tribal influences were at work shaping the Latin tongue in conformity with the local lingual tendencies. Out of these various native lingual influences grew the modern Romance languages, Italian, French, Spanish, Rumanian, Romanish, Portuguese, Sardinian, Dalmatian (now extinct), Provençal, Catalán and Franco-Provençal. The formation of these Romance tongues was possible only through the spread of Roman rule and the predominance of Latin over Etruscan, Umbrian and other Italian dialects, and also over Iberian and Gallic. The power of Rome in the provinces was shown in the imposition of the Latin tongue on the inhabitants of France and Spain, throughout practically all of which territory and the rest of the vast Roman possessions it was, by the time of Augustus, spoken, with unimportant dialectic variations.

Notwithstanding the fact that the Romance languages are essentially Latin in vocabulary, yet many changes took place in the Roman tongue before it finally became one of the Romance languages; and these changes were not always the same. Even in France itself there were two distinct forms of the Romance tongue, and various dialects. In Spain the Castilian and the Catalán developed differently; and there also grew up different dialects which still mark off very distinctly different localities of the Iberian Peninsula. Similar conditions prevailed in Italy. The Italian spoken in the Po and Liguria districts very much resembles the northwest Romanic speech; but it has evidently been also influenced by the dialects of other parts of the country, which forced upon it the loss of the «s» so common in the Iberian tongues. In the centre of Italy the Italian dialect was considerably influenced by the northern speech; but in the south, a combination of native dialectic speech and Greek and other influences worked together to produce a very considerable variation from the speech of northern Italy in vocabulary, accent and idiomatic turns of expression. In Portugal too local conditions produced a Romance tongue considerably different from Spanish, French and Italian.

The breaking up of the Roman Empire, removed the one great tendency which held together the various different ethnic elements that composed the Roman domains. Political disintegration followed and brought with it the isolation of various districts. This isolation was helped by the invasion of the Latin country by various Germanic tribes. The Goths, Lombards and Franks have left their traces on Italy; in Gaul, the Franks took possession of the north, the Burgundians of the east and the Visigoths of the south, during the last half of the 5th century. The Visigoths also overran most of Spain. Under these new conditions new groupings of people succeeded, and out of them sprang new and vigorous nations each of which spoke the Latin tongue in its own way. Soon the people speaking the new tongues could not understand Latin, a proof that the conditions that produced them must have been working silently for a very considerable period of time. Rapid changes in the form of the vocabulary and grammar of these new tongues followed. The primitive peoples who had fallen heir to the Latin language found it too complicated for their simple uses. So they promptly discarded the future and the passive forms of the verb and, in most cases, made the plural form end in «s.» Later on, when they found the need of the future and passive, they formed the former by means of an auxiliary verb and substituted for the latter a reflexive form. The Latin genitive, too, gradually disappeared, and the accusative became the common form of the substantive after prepositions, and finally the only form. The future had early been replaced by the present; and this old use of the present and also its employment to replace the perfect is still common in dialect speech and the language of the illiterate in the Romance tongues. The profuse use of diminutives in -ullus and -ellus, noticeable quite early in the Romance tongues, was carried to excess in Italian and Spanish; and the Latin Americans have so abused this effective feature of the Romance tongues as to injure the beauty of Spanish. Articles were also manufactured out of the pronouns ille and ipse, which assumed distinct forms in the different Romance languages. The genitive, when it went by the board, was replaced by de with the accusative. The frequent use of the accusative in this connection led to the suppression of the nominative and the employment of the accusative in its place, thus aiding that simplicity which always appeals to rude undeveloped intelligences.

The causes that led to the formation of the Romance tongues had their origin, for the most part, in phonetics. Since the vocabulary of these languages is still essentially Latin, Spanish has radically simplified and developed the full sound of the vowels at the expense of the consonants. The Latin accented *e* becomes, in Spanish, *ae*, and the *o* becomes *ue*, while there is a strong tendency to weaken the initial consonant. Thus the Latin porta becomes puerta in Spanish, tempus becomes tiempo and bonus, bueno. Portuguese, on the contrary, is very careless in the articulation of both vowels and consonants; it avoids the diphthongs that Spanish likes, and as if going to the opposite extreme, the initial sounds are strongly pronounced. Portuguese, like French, has a strong nasal tendency, which is entirely absent from Spanish and Italian. It has also, a strong tendency to contract unaccentuated vowels. The Latin cælum, for instance, which became cielo in Spanish, has become ceo in Portuguese.

French differs from Spanish in its suppression of the Latin final vowels, *a* excepted, or their transmission into *e*. This tendency is noticeable in Provençal and Catalán, but it is stronger in the north of France than anywhere else. This tendency to contraction has left the French tongue practically without accent, while the opposite tendency in Spanish has made the latter tongue one of the most, if not the most, sonorous of the Romanic group.

**Germanic Influence.**— The Germanic tribes probably helped toward the disintegration of the Latin tongue in Italy. But this disintegration was long protracted and slowly evolved as should be the natural growth of a language. This prevented the various foreign influences becoming great at any particular time. The German mercenaries, who were largely used in the Latin armies, naturally brought into the country numerous German words relating to their life and occupation, which belonged to the camp. The names of grains, animals and persons in use among the Germans, but unfamiliar to the Romans, bore their native designations on their introduction into Italy. These words naturally assumed Latin forms, and they so identified themselves with Latin speech that it is difficult, at times, to recognize their foreign origin. The Goths, Lombards and Franks influenced the northern and central parts of the Italian Peninsula much more than they did the south, where Greek and Carthaginian played a very considerable part in the local appearance assumed by southern Italian. This influence is still noticeable in the strong quantitative accent placed upon the accented vowel throughout the south and southwest of Italy.

As the natives, after the Roman conquest of Gaul, continued to be the mechanics, artisans and laborers, they naturally contributed to the store of Latin words, designating such occupations by names given them in their own Gallic tongue. As Gaul remained largely agricultural, during the Roman occupation, and as, in the beginning, the Roman task masters and employers of labor found it easier to learn the native names for the implements of labor, grains and processes than to teach the natives the Latin designation therefor, many agricultural terms of Gallic origin became current in the Latin spoken in Gaul. The same thing happened to the native tongues in Spain and Portugal. In the south of Italy and the adjacent islands, for practically the same reason, agricultural terms and especially names of farm and garden products have generally quite different names from those they bear in other parts of the peninsula. Yet notwithstanding these natural differences and those occasioned by accent and intonation which distinguish the speech of one locality from another and the great language groups to-day throughout all the territory that once constituted the western empire of Rome, the Romance tongues are surprisingly Latin in the composition of their vocabularies, the changes that differentiate them from one another and that mark the dialects of each language group being very largely phonetical; for however great the changes may be that have taken place in the Latin vocabularies in their transmission into the Romance tongues, they have not materially interfered with the roots or the accents of the Latin words. This fact has rendered the task of the Latin philologists much easier than it could have been had the accentuated vowel not persisted, subject to certain regular known modifications.

**Inter-influence.**— Naturally, being so closely related and having a common origin within historical times, the Romance tongues have acted and reacted upon one another. Moreover they have been acted upon by the German language, since their rise to the dignity of national tongues. Of all the Latin tongues French has had the greatest, deepest and most far-reaching influence not only upon the Latin and German languages, but upon other languages of Europe; and the Norman French gave to English two-fifths of its vocabulary. This French influence, begun in the time of Charlemagne, has extended to our own day, and is still being unconsciously exercised, though now in a somewhat more restricted degree. As the diplomatic language of Europe, as the voice of the leaders of fashion, as the tongue of the profoundest and wittiest literary critics of Europe and the leaders of science and of Romance philology it has long continued to furnish thinking Europe with concise names and expressions as they have suddenly found the need of them. In the age of chivalry, in the Renaissance and the centuries that witnessed the growth of diplomacy, the French tongue continued performing its good offices for the other languages of Europe. Even Germany and the other countries in which the Germanic languages were spoken felt this French influence strongly in the court, art, literary and military circles.

While the Spanish, Italian and Portuguese languages influenced one another and other European tongues, their influence was sporadic and very much less than that of French. Spanish and Portuguese were, to some considerable extent, influenced by the aboriginal American tongues; and many of the words from this source were passed on to the other languages of Europe. Many Spanish words came into English and some into French through the contact with Spain in the American colonies. Very many words derived from the indigenous American tongues are in use in the different Latin-American countries. The names of plants and animals, agricultural terms and the designations of places have contributed very largely to this Indian element in the Spanish tongue. However, the use of most of these foreign words is confined to localities in America and but a comparatively small number of these native designations have become domesticated in Spain. Yet, as they enter into the very lives of the Latin-American nations, they seem to have come to stay. They, therefore, help to make the Spanish tongue, as spoken in America, different from that of Spain. Thus the literatures of the different Latin-American republics have each its own peculiar individuality, marked by local vocabulary and terms of expression.

Spanish was also influenced by Arabic during the Moorish occupation of the country, and these Moorish words and idiomatic expressions have, many of them, been carried to America. In the same way, the Greek and Carthaginian words that found their way into Catalán, have found lodgment in the Spanish spoken in certain section of Latin America. See Phonetics; Language, Science of, and each of the Romance languages.

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**ROMANCE OF THE ROSE.** See ROMAN DE LA ROSE.

**ROMANCERO DEL CID,** a collection of *romances* or ballads which sing of the mighty deeds of Ruy Diaz de Bivar, the Cid Campeador, the national hero of Spain. Curiously enough there exists no single *romancero* in which are included all the Cid ballads. This is due to the fact that new ballads are being constantly found which had not been put into print. The first ‹Romancero del Cid of Juan de Escobar› dated 1612 contains only 102 ballads, the most complete modern collection, that of Carolina Michaëlis de Vasconcellos of 1871, contains 205. It was during the 16th and 17th centuries that the ballads reached the height of their popularity and passed from the oral to the written stage. Most of the ballads we have preserved to-day are not ancient. The tales they tell are those of the old ballads but the language is that of the classic period, and some of them have unknown authors. The early ballads were the most oft-repeated and favorite parts of longer poems. They represent a more democratic form of literature than such long works as the ‹Poema del Cid› and the ‹Crónica Rimada,› poems of an aristocratic and chivalrous age. Often the ballad is the result of a popular embellishment of an event found in the longer songs. In the 18th century the Cid ballads decayed somewhat in popularity but during the Romantic period they flourished as never before. John G. Lockhart's ‹Ancient Spanish Ballads' though containing only eight Cid ballads is important because it has been accepted as a classic by several generations of English-speaking peoples. A more scholarly but still poetic translation is James Y. Gibson's ‹Eighty-three Cid Ballads.› The Cid ballads are dramatic, realistic and virile; they rarely lapse into the puerilities of some other types of folklore poetry. In them the Cid may be idealized from a historical point of view, but to the Spaniard he is the noblest type of warrior carried to the height of perfection. For a fuller account of the ‹Romancero del Cid,› consult Fitz-Maurice-Kelly, James, ‹Chapters on Spanish Literature› (I and IV); and Morley, ‹Spanish Ballads› containing nine Cid ballads with vocabulary, notes, and excellent bibliography.

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**ROMANES,** rō-män′ĕz, **George John,** English scientist: b. Kingston, Canada, 20 May 1848; d. Oxford, 23 May 1894. He was graduated in 1870 from Caius College, Cambridge, studied in France, Germany and Italy and in 1874–76 worked under Burdon Sanderson in the laboratory of University College, London, and carried out important researches in nervous excitability. In 1879 he was elected Fellow of the Royal Society and in 1878 published, under the pseudonym «Physicus,» a work entitled «A Candid Examination of Theism,› in which he took up a somewhat defiant atheistic position. Subsequently his views underwent considerable change; he revised the ‹Candid Examination,› and toward the close of his life was engaged on ‹A Candid Examination of Religion,› in which he returned to theistic beliefs. His notes for this work were published after his death, under the title ‹Thoughts on Religion,› edited by Canon Gore. Romanes was an ardent supporter of Darwin and the evolutionists and in various works sought to extend evolutionary principles to mind, both in the lower animals and in man. He wrote very extensively on modern biological theories. His chief remaining works are ‹Animal Intelligence› (1881); ‹Scientific Evidences of Organic Evolution› (Nature Series, 1882); ‹Mental Evolution in Animals› (1883); ‹Jelly-fish, Star-fish and Sea Urchins› (1885); ‹Mental Evolution in Man› (1888); ‹Darwin and after Darwin› (1892–95); ‹Examination of Weismannism› (1893); ‹Mind and Motion, an Essay of Monism› (1895). In 1896 appeared a volume of ‹Essays,› a selection from his ‹Poems,› and his ‹Life and Letters,› edited by his wife. Consult Carus, P., ‹Dawn of New Religious Era› (Chicago 1899).

**ROMANESQUE ARCHITECTURE.** The somewhat misleading name Romanesque is applied to the non-Byzantine architecture of Christian Europe generally, from the fall of Rome (476) to the rise of Gothic architecture in the 12th century. Its greatest development began with the 11th century and continued well into the 12th. While in certain regions the influence of Roman remains was considerable and while in Italy traditions of Roman design persisted long, the outstanding characteristic of the Romanesque architecture generally is its independent development along predominantly structural lines as the parent of the splendid Gothic styles of the 13th to 15th centuries. It has, indeed, been called by some writers the «round-arched Gothic» style. It was throughout an architecture of religion, because the Christian Church was the chief civilizing agency of the early Middle Ages. Outside of Italy, and to a great extent there also, it was an architecture of monasteries, especially of the great Benedictine order. It is, however, really not one style but several. In Italy it developed the Basilican or Latin style in and around Rome, the Lombardy style in Lombardy and the north, the Tuscan Romanesque in Florence, Pisa and their neighborhood. The Byzantine style was influential in eastern Italy and in Sicily the Arabic and Byzantine influence mingled with the basilican tradition. Another phase was later developed along the Rhine Valley. It was in France that it took on the greatest independence and vitality, though there, also, are many marked provincial variations; and from Normandy it spread to England, taking on a new character called the Norman, or more properly the Anglo-Norman.

**General Character.**— All the Romanesque styles show steady progress from the crude and simple efforts at architectural expression of communities slowly emerging from the chaos of the centuries following the fall of Rome, toward a highly organized, structurally elaborate type of church edifice and of monastic buildings. The church *plan*, at first simply basilican (see BASILICA), became increasingly varied and complex to meet the growth and changes of liturgy and ritual. The transept and crossing became more important; a lantern, tower or dome was often erected over the crossing; the eastern arm of the church was lengthened and chapels for the worship of various saints opened out from the transepts and apse. Bell-towers were added, detached in Italy, attached in France, England and Germany. *Structurally* two great changes from the early basilican types were evolved; (a) masonry piers, square, round or clustered, took the place of columns between nave and aisles; and (b) vaulting gradually replaced the wooden ceilings, first in the side-aisles, later in the high central aisle or nave. In Italy the supply of antique marble columns led to a longer continuance of the use of columns, the tradition lasting even after Roman shafts were no longer to be had, and many Lombard, Tuscan and Sicilian churches have columnar interiors. Elsewhere piers of stone had to be used from the first. The use of vaulting was primarily the result of scarcity of timber and of the destruction by fire of many of the wooden-roofed churches. These two changes compelled a far more massive construction than that of the non-vaulted wooden-roofed, columnar basilicas. The masonry was at first crude and heavy, especially in France and England. Walls were thick; round arches were universally used and built of stepped section with splayed or stepped jambs and jamb-shafts, especially in the doorways. Carving was at first scanty and rude, but advanced steadily in richness and refinement and in the 12th century sculpture was rapidly developed, especially in France. Vaulting became more scientific; groined vaults everywhere displaced the heavy barrel-vault over the nave as well as the side-aisles and in the 12th century the use of vault-ribs became general in their construction. The problems of support and abutment created by these changes compelled new experiments in the construction of walls, piers and buttresses, in which the masonry was more and more concentrated at the points of chief strain. (See BUTTRESS; VAULT). In all this structural development wholly new forms of architecture were created, both in the masses and details. In addition the monasteries developed the cloister with its arcaded court and various types of chapels, refectories and other dependencies. In general the exteriors of buildings were severely plain, except the richly carved portals; the interiors of churches were increasingly spacious and lofty as the style developed. Domical baptisteries and round chapels were frequent in the earlier centuries, especially in Italy and the Rhine Valley.

**The Subordinate Styles.**— The *Lombard* churches adhered in many cases to the basilican plan with wooden roof-ceiling; but vaulting was also early used, as in San Ambrogio, Milan, and the vaulted churches varied greatly in plan. The round window, the splayed and shafted portal with a porch and the arcaded cornice are characteristic. The *Tuscan* employed banding and paneling in white and black marble externally and in and around Pisa richly arcaded façades were common. The great domical baptisteries of Florence and Pisa also belong to this style. The *French Romanesque* churches were frequently vaulted, sometimes with barrel-vaults (Autun, Clermont-Ferrand, Issoire); more often with groined vaults as at Caen. The exteriors became increasingly varied and structurally expressive, with twin towers at the west end and figure sculpture attained high merit (Saint Trophime and Saint Gilles at Arles; Chartres). In parts of central France (Périgueux, Angoulême) domical vaulting betrays Byzantine influence via Cyprus and Venice. The *Anglo-Norman* churches, often of vast size (e.g., Saint Alban's, over 500 feet long) were almost always roofed with wood over the high central nave, with vaulted side-aisles. Square central lantern-towers, round nave-piers and the carved zigzag are frequent. The *Rhenish* abbey churches are noted for their picturesque masses and many towers: they often have an apse at each end (Worms, Mayence, etc.). In the 12th century many wooden-roofed churches in France, England and Germany received vaulting.

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**ROMANINO, Girolamo**, jē-rō-lä'mō rō-mä-nē'-nō, Italian painter: b. Brescia, about 1485; d. there, 1565. He was a pupil of Feramola in Brescia and between 1509 and 1513 lived at Padua and Venice, where he studied the rich golden coloring of Giorgione and learned the art of reproducing it in his own works. After completing (1519–20) four frescoes in the cathedral at Cremona, he returned to Brescia. All his pictures are remarkable for their skilful composition and splendid coloring, but in his later works his tones become silvery, clear and cold and lose the warm lustre of Giorgione's sunset tints. He painted many altar-pieces, of which the most remarkable are 'Madonna and Child' and 'The Madonna with the Dead Christ' (in Berlin Museum); 'Adoration of the Infant Christ' (in the London National Gallery, a good example of this painter's manner); 'Nativity (in the Church of San Giuseppe at Brescia); and an 'Assumption' (in the Church of Sant' Alessandro, Bergamo). He also painted some frescoes in the castle of Malpaga near Brescia, the home of the famous Colleoni, the commander of the Venetian armies. There are some fine portraits by Romanino to be seen at Brescia.

**ROMANOFF**, rō-mä'nŏf, the name of the late reigning family in Russia, founded by Michael Feodorovich Romanoff: b. 1598; d. 1645. He was descended through his grandmother from the family of Ruric, the founder of the Russian empire and came to the throne in 1613 by election of the boyars and the higher clergy. The early part of his reign was troubled by the Poles and by turbulent nobles. Western civilization gained an entrance into the country and many foreigners, particularly Scotchmen, became naturalized. France tried to disturb the commercial monopoly of England in Russia. Michael was succeeded by his son Alexis and the male succession of the Romanoff family continued until the death of Peter II in 1730, when the crown devolved upon Anne, Duchess of Courland and continued in the succession of the female Romanoffs until the death of Elizabeth in 1762. The latter was succeeded by her nephew, the son of the Duke of Holstein-Gottorp, who ascended the throne as Peter III and established the dynasty of Romanoff-Oldenburg, which ended with the deposition of Tsar Nicholas II (q.v.) in March 1917. Consult Bain, R. N., 'The First Romanovs' (New York 1905) and Edwards, H. S., 'The Romanoffs: Tsars of Moscow and Emperors of Russia' (London 1890).

**ROMANS, Epistle to the. Authorship.**— That the Apostle Paul wrote the Epistle to the Romans is practically undisputed, for the very few critics who have ever denied it (scarcely more than the little «Dutch School» of the latter part of the last century) have found no recognition for either their arguments or their conclusions. The claim of Pauline authorship in the opening address (i, 1) is confirmed not only by unanimous tradition but also by the whole tone and contents of the letter, so that sane historical criticism unanimously asserts it with the utmost positiveness.

**Destination.**— It is as little to be doubted that the letter was addressed to the Christians in the city of Rome. The name of the city stands both in the opening address and a little later in the same chapter (i, 7, 15), and this is confirmed alike by unanimous tradition and by many things in the letter itself, as, for example, that Paul writes in i, 10–13 and xv, 23, 24, 28, in a fashion which would fit with no other city we can name, especially as we know from Acts xix, 21, that he did have the fixed purpose of visiting that city. While the omission of the name Rome in a few authorities, none of which is of any special value, raises a somewhat perplexing problem for textual criticism, the result is such as in no way to shake the confidence of scholars in the Roman address of the Epistle.

**The Roman Church.**— The origin of the Christian Church at Rome cannot now be traced. It is probable that many influences and elements combined to make it. Some Jews from Rome were in Jerusalem on the Day of Pentecost (Acts ii, 10) and they may in some cases have returned to Rome, carrying their newfound faith; when persecution scattered the Jerusalem Christians (Acts viii, 1), some may have wandered as far as Rome; as the facilities for communication throughout the empire were better than they were again anywhere in the world till during the last century, and as the capital of the empire was a great magnet which drew from all over the world, men and women who had elsewhere been converted to Christianity may have drifted to Rome in considerable numbers during the quarter of a century which intervened between the resurrection of Jesus and the writings of Romans. Thus even if one deny the traditions of an Apostolic origin for that Church, it is easy to see that from the very nature of the case there must have been many Christians in the city when Paul wrote. Many would naturally be of Jewish descent, so that there is nothing improbable in the interpretation which many give to the words of Suetonius narrating the expulsion of the Jews by Claudius, to the effect that the disturbances were not due to the general Messianic hope, but to conflicts based on a difference of opinion as to whether Jesus was the expected Messiah. It is also known that there were many proselytes and others, who were associated with the Jews, being attracted by the lofty spiritual worship of their monotheistic faith and the strict purity of its moral precepts. It has been held by some that the church at Rome was mainly made up of Jewish Christians at that time but the prevalent opinion seems to be fully justified, especially by what we find in the letter itself as well as by the probabilities of the case, that the dominant element in the church was Gentile, as was doubtless already true almost everywhere outside of Palestine.

**Date and Place.**— From the epistle itself (xv, 25) we learn that it was written just before Paul's visit to Jerusalem to carry up the great collection which he had gathered from all the churches which he had founded. From Acts xx, 3, we learn that Paul spent in Corinth the three months before setting out on this journey, and everything fits with the view that this Epistle was written during the period of comparative leisure and calm which this visit may well have afforded him. There are also greetings at the close of the letter (xvi, 23), which are best understood as from Corinthian Christians, and Cenchreæ, from which place Phoebe, the bearer of the letter, was to set out, was close by Corinth. While most of Paul's letters can be dated with satisfactory certainty so far as the relations to other events in his life work are concerned, there still remains much uncertainty as to the calendar years to which these events should be assigned. The date usually given to the stay in Corinth and the writing of Romans is the winter of 57–58, but some chronologists date the events accompanying its composition several years earlier.

**Integrity.**— There has been much discussion as to whether we now have the Epistle to the Romans in the form in which it was sent to them by the Apostle, or whether it now contains material which has been added to its original form. This question relates mainly to the last two chapters. It is known that Marcion in the 2d century rejected these chapters, and there seems to be some evidence that such a shorter edition was in circulation in other circles of Christians. The doxology which in the Greek Textus Receptus, the Vulgate and the English translations stands at the end of the present Epistle (xvi, 25–27), is found in a considerable number of manuscripts, some versions and the works of several Fathers at the end of chapter xiv, while in a very few authorities it stands in both places. Also a system of notation for reading in church seems to have ignored all which comes after the end of the fourteenth chapter except the doxology. These facts may, however, be explained on either of two hypotheses, either that the section from xv, 1, to xvi, 24, was passed over in selecting Scripture readings for public use, and that this influenced copyists to drop it out, or that a shortened form of the Epistle was circulated for a time, possibly with Paul's own authority, as a sort of treatise or circular letter. The latter hypothesis would also furnish an explanation of the omission in two manuscripts of the words «in Rome» (i, 7, 15). A strong argument in addition to the overwhelming external evidence in favor of the text as it stands is the unity of the section xv, 1–13 with chapter xiv, which seems to show decisively that this was part of the original letter, and consequently that it could not have ended with xiv, 23. It is also held by some critics that the many salutations of xvi, 1–16, could not have been intended for the Christians in a city which Paul had never visited, and, therefore, that a letter of recommendation for Phoebe addressed to some other church, most probably Ephesus, has in transmission become combined with the letter to the Romans. There is, however, no real impossibility in the view that those whom Paul saluted may have been residing in Rome at the time. Some are known to have had a connection with Rome, as Prisca and Aquila, who may well be presumed to have returned from Ephesus to their old home as soon as practicable; many of the names fit quite as well in Rome as in Ephesus, especially the mention of the households of Narcissus and Aristobulus; and it has also been noted that the salutations are always more numerous in letters to churches where Paul had not worked than where he had, and he might well have desired to strengthen his hold in Rome by every possible appeal. Finally, it has been doubted that the closing doxololgy (xvi, 25–27), could have been penned by the Apostle, but against its genuineness can be urged only subjective impressions, the weight of which is fully neutralized by the equally trustworthy feeling of a much greater number of critics who find the doxology to be alike in sentiment and in expression clearly Pauline. On the whole, the conservative position, that we have the letter in the form in which Paul wrote it, has been by no means overthrown and is held by the majority of scholars with as much confidence as ever.

**Occasion and Purpose.**— It has sometimes been said that this Epistle is really a treatise rather than a letter, that Paul deliberately set about giving a systematic exposition of his theology. But it is to be noted that the exposition is far from being a complete statement of Paul's doctrinal views, while on the other hand there is much in the book which is truly epistolary in character, so that this view cannot satisfy. Others have held that it was purely a controversial and polemic document, an endeavor to counteract the work of Judaizers at Rome as he had met them elsewhere. But while the arguments used are doubtless those which Paul had often used in controversy with his antagonists, yet the controversial note is much subdued, as will be seen if Romans is compared with Galatians, and there are no tokens that the Judaizers had already begun work at Rome, at least so far as Paul knew, though it may be that the vigor and sternness of the warning in xvi, 17–20, is due to news that the danger was less remote than he had hoped. The real purpose of the letter is best seen in connection with its occasion. Paul, who since leaving Antioch had worked only among churches of his own founding and had made them in turn in some sense a basis for his further work, now hopes to go to Rome where there are already numerous Christians, and after working there for a time to go on to Spain in further missionary endeavor. It is important, in order that his work among them may be successful, that they should have a clear idea of the way in which he presented his ‹Gospel.› Accordingly he makes a somewhat full and systematic statement of the truths which he chiefly presented in his preaching, man's sin and God's grace of salvation through Christ. Necessarily reviewing to a great extent the various arguments used in controversy with the Judaizers, he makes a clear and well-reasoned statement in a form as conciliatory as possible, in order that so far as it could be secured in this way he might find a welcome and help in his work when he reached Rome.

**Contents.**— The epistle naturally falls into four main divisions, the first two of which are doctrinal, the third relates to the problem of the unbelief of Paul's own nation, and the fourth is ethical. After an epistolary address, expanded beyond parallel (i, 1–7), and some pleasant words about his desire to visit the Roman Christians (i, 8–15), he states in i, 16, 17 the theme with which he is to deal, viz., that the Gospel is the divine power to save. The truths in regard to this salvation he develops first in relation to forgiveness of sin (i, 18–v, 21), and then in relation to the spiritual consequences of this salvation as shown in the life of faith and goodness (vi, 1–viii, 39). It may be remarked that the significance and importance of the truths brought out in this section have been too much ignored both by friends and opponents of Paul's doctrine, and that men have too much failed to see that to him salvation was not a mere matter of release from the penalties of sin, but was also an inward and spiritual fact, that the right character and life by the power of the indwelling Holy Spirit is an essential part of the salvation which he preached. In chapters ix–xi the author deals with the problem how it was that the Jews as a nation did not accept Christianity. The concluding section (xii, 1–xvi, 27) is devoted to injunctions to live rightly in all the relations in which the

Christian finds himself. The whole book is dominated by an unparalleled note of catholicity and universality. All men are sinners and need a Saviour: salvation through Christ is for all men: even the unbelief of the Jews was in order that God might have mercy on all.

**Value.**— The epistle to the Romans has proved itself one of the greatest «books of power» which the world has ever seen. It is a masterful, though of course unconscious, revelation of what the great Apostle himself was. As Jülicher says: «In chaps. i–iv we have the Rabbinical schoolman, in viii and xi the inspired poet, in xiii and xiv the sober, careful director of conduct and in ix the bold thinker who follows out to its logical conclusion the argument which makes all things begin and end in God. The Romans would not be able to disregard such a man or to lock their hearts against him, unless they had previously determined to make no terms with him whatever.» The influence of the thought it contains has been immeasurably vast and farreaching. While it was somewhat overlooked for centuries, its influence on the spiritual life of Protestantism due to its rediscovery by Luther has been incalculable and this influence in varying measure continues to this day among the most profound Christian thinkers. Luther styled it «the chief book of the New Testament and the purest Gospel.» Godet said: «M. de Pressensé has called the great dogmatic works of the Middle Ages ‹the cathedrals of thought.› The Epistle to the Romans is the cathedral of the Christian faith,» and the philosopher Coleridge called it «the profoundest book in existence.»

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**ROMANTICISM.** The word «Romantic» is derived from the old Romanic or Romance languages, which were formed by a fusion of Latin as spoken by the common people of Italy with the native tongue of the northern barbarians who invaded that country. This Romance speech naturally assumed a variety of forms, but it reached its highest development in Provence, in southern France, where it became an important instrument of popular literary expression, especially during the 11th and 12th centuries. The compositions which appeared in this vernacular tongue were generally tales and ballads in which the adventures of knights in pursuit of honor, or in devotion to the Christian religion, or the enthusiastic deeds of chivalry, and the spirit of loyalty and reverence for women were portrayed. Another mark of this literature is its evident fondness for events that are strange, mysterious and supernatural. The name «romance» then, first applied to the language in which those compositions were written, came afterward to refer to the prevailing characteristics which they displayed, as contrasted with the works written in Latin, which were termed «classical.» During the 18th century, which delighted to term itself the «Augustan Age,» and prided itself upon its purity and refinement of taste, the classical models and modes of expression were regarded as furnishing the only correct standards, while the literature and art of the Mediæval Period was regarded as barbarous, and its whole mode of thought and life to be characteristic of Dark Ages that were unworthy of the attention of a cultivated man. At the close of this century, however, and during the early decades of the 19th, a marked change manifested itself in the whole tone and tendency of the intellectual life of the time. This mental revolution, which is known as the Romantic Movement, affected all departments of thought, and all artistic and literary standards and modes of expression. From the first this movement showed a consciousness of its opposition to the generally received intellectual conceptions and prevailing artistic and literary standards of the time, though this contrast was less violently emphasized in England than in Germany and France. Goethe noted and commented upon the difference between the old tendency and the new, describing it as equivalent to that between the «diseased» and the «healthy»; while Schiller contrasted them as the «naive» and the «sentimental.» It was Friedrich Schlegel who first employed the terms «classic» and «romantic» to characterize this opposition. Since that time many writers have undertaken to define and explain the fundamental distinctions between these tendencies, especially as they express themselves in art and literature. The following points appear to be most significant: (1) The main marks of classicism are simplicity, directness and nobility, and perfection in achievement. In a classic work of art there are no evidences of a lack of harmony between the ideas and the medium, no suggestion of something remaining that cannot be expressed. As a consequence, the personality of the artist is not expressed, the artist is lost in his work, which stands impersonal and objective. He does not show us his own attitude toward the subject matter, his emotional struggles and the play of his life. The Romanticist, on the other hand, puts himself into his work; it is no disembodied idea of beauty that he seeks to express, but his own personality, the longings, hopes and ideals of a spirit that has a tendency toward the infinite, and which, therefore, can never express itself in any finite and objective medium. Classicism is thus always definite, objective and complete, while Romanticism is always touched with subjectivity, and thus with a suggestion of incompleteness, which is due to the fact that it seeks to convey the mystery of spirit for which no objective mode of expression is adequate, and which, therefore, can only be symbolized and vaguely suggested. (2) As Romanticism endeavors to express what is strange and mysterious in the life of spirit, it naturally seeks its material in the past and feels itself especially in sympathy with the Middle Ages, when the aspirations of the spirit, its love of adventure and sense of the mysterious expressed themselves in quests for the Holy Grail, in crusades and gallant deeds of chivalry and knight-errantry.

Thus a sympathy with the past, a new interest in humanity as such, marks Romanticism. (3) Just because classicism sought to express the idea of beauty in definite and objective form, it was possible to lay down fixed canons of procedure and so to render the result formal, precise and almost mechanical. Romanticism, however, aims to represent what is inner and subjective, and, therefore, necessarily protests against making art stilted and formal by the application of external rules and mechanical standards. Art, the Romanticists declare, must spring from the untrammeled expression of the free spirit of the man of genuis. «The will or caprice of the poet,» as Schlegel says, «admits no law above itself.»

**The Romantic Movement.**— The romantic movement may best be understood if we regard it as a part of the general intellectual revolution of the 19th century, and as one in spirit with the historical and scientific spirit of modern times. The entire spiritual attitude of modern life, as contrasted with that of the 18th century, may be characterized as a new consciousness of infinite possibilities and boundless aspirations. The spirit knows itself as infinite and is also conscious of the infinite task set for the individual through its own demand for expression and realization. The new tendency turns away in disdain from the mechanical conceptions and formal syllogisms in which the 18th century had self-complacently summed up the universe, it laughs to scorn the unintelligent and formal imitation of classical models that bases itself on ancient canons; it denounces the ethical principle of prudence; it declares that the infinitely mysterious law of life cannot be comprehended by the principle of self-love; it refuses to believe in a transcendent God. The new movement is thus romantic through and through, filled with a sense of mystery and wonder, with the love of adventure and discovery, and with the buoyant spirit of aspiration. As Wordsworth says: «In that dawning age 'twas bliss to be alive, but to be young was very heaven.» This tendency to advance to new achievements manifested itself in many and various directions. In philosophy it led to a new and fruitful attempt to comprehend in more adequate terms God, nature and the place and significance of man's life in the universe. The result of this is seen in the systems of Kant and the German idealists. On another side the new interest in man and the affairs of man's life has given rise to the modern historical movement which has made its influence felt in every department of thought and culture. It is this historical interest, united with the Romantic spirit of adventure and discovery, which is just the assertion of the confidence of Reason in itself, that has called into being the evolutionary sciences of nature. The concept of evolution has transformed the older view of nature, just as it did our view of man when it was earlier applied to illumine his social, ethical and religious life. For evolution is just an attempt to explain the world by showing the relations between things as parts of a single living process. It, therefore, always emphasizes organic relationships and views things as parts or stages in a dynamic process, instead of taking each thing as something static, an element existing in isolation as something in itself independent and having only external relations to other things. The Romantic movement in art and literature must also be regarded as an expression in different fields of essentially the same attitude of self-assertion and consciousness of the creative movement of life that is manifested in philosophy and the new sciences of history and biology.

**Romanticism in England.**— In England a new spirit was perceptible in literature soon after the middle of the 18th century. This new movement, however, was not so intense or so fundamental in scope as its counterpart in Germany, which began a little later. For the introduction of a natural literature into England, expressing a sympathy with nature and an interest in the past, while disregarding the rigid canons of the Augustan Age, was in a way but the restoration of the healthy natural traditions that had expressed themselves in Chaucer and Spenser, in Shakespeare and Milton, and in the folk-songs and ballads, which were collected and edited by Thomas Percy in his ‹Reliques of Ancient English Poetry,› in 1765. It was thus not marked by the keen sense of opposition to the prevailing system that characterized the tendency in Germany, and at a later time, also in France. Moreover, perhaps for this very reason, it did not penetrate so deeply into the spiritual life of the people, or show its effects markedly in all departments of intellectual life, as in Germany. It appears mainly as a literary movement, with which is connected some new tendencies in painting, and also as a revival of interest in Gothic architecture, which Horace Walpole did much to promote. But the movement did not involve a fundamental transformation of philosophical and scientific conceptions. This transformation came about at a later period during the 19th century, and was largely the result of the influence of German thought as represented by Coleridge and Carlyle, aided by Darwin's discovery and applications of the doctrine of evolution. The names of Gray, Cowper, Scott and Burns are usually placed among the English Romanticists, as well as those of Wordsworth, Coleridge, Southey, Byron, Shelley and Keats. A little later we have the revival of interest in Dante, which culminates in the pre-Raphaelite movement.

**The Romantic School in Germany.**— Lessing stands as the first to challenge the canons of the classic art and literature. Herder is at once the pioneer of the modern historical method and one of the first to appreciate the value of what is natural and spontaneous in literature. Influenced no doubt by the publication of Percy's ‹Reliques,› he made a collection of the folk-songs of Germany. In Goethe's ‹Werther› and Rousseau's ‹Confessions› we have two books of nearly the same date that show many of the marks of extreme Romanticism. The name «Romantic school,» however, is usually applied to a group of men whose main centre of activity was first at Weimar and Jena and afterward to some extent at Berlin, and whose work extends from about 1775 or '80 to 1806. The main names of this school are the brothers Friedrich and A. W. Schlegel, the philosopher Schelling, Novalis (whose real name was Friedrich von Hardenberg), Ludwig Tieck and the theologian Schleiermacher. The main result of this movement was philosophical and æsthetic, though it led to some important results in the way of historical investigations. Heine, Immermann, Freytag and von Scheffel all exhibit the characteristic Romanticist fondness for the picturesque and the mediæval. Another group of men — Uhland, the brothers Grimm, von Arnim, J. Görres and Brentano, who represent a more distinctly literary movement with strong national characteristics — are often called the younger Romanticists, whose centre of activity was at Heidelberg, where their organ, the *Zeitung für Einsiedler,* was published.

**Romanticism in France.**— We have seen that Rousseau may in a sense be called one of the earliest Romanticists. As a result of the Revolution and the prolonged Napoleonic wars, literature received little attention in France during the years that were most fruitful in Germany and England. Chateaubriand and Mme. de Staël are sometimes said to be the forerunners of Romanticism in France. But the tradition of classicism was strongly intrenched, and even Victor Hugo at first adhered to this standard. But in 1826 in the ‹Odes and Ballads,› and in the following year in the preface to the play entitled ‹Cromwell,› he declared his allegiance to Romanticism, and at once became the leader in a new cause into which he threw himself with all the fervor of his enthusiastic nature. Besides Hugo, the principal French Romanticists are Alf. de Musset, Ch. Nodier, George Sand, Th. Gautier and Balzac.

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**ROMANUS I,** rō-mā'nŭs, **Lecapenus,** Byzantine emperor: d. Island of Protea, 948. He served in the imperial navy, and was in command of the Byzantine fleet on the Danube in 917, when hearing of the defeat of the army at Achelous, he at once set sail for Constantinople. His designs on the throne were furthered by his popularity with his sailors and the people, and after the marriage of his daughter, Helena, to Constantine VII he rose steadily in power, and in 919 was crowned colleague with his son-in-law. He exercised so much influence over the latter as to make him the real ruler until 944, when Constantine, aided by the sons of Romanus, caused him to be carried off to the island of Protea, where he was forced to become a monk, while Constantine was proclaimed sole emperor.

**ROMBERG, Moritz Heinrich,** German pathologist and neurologist: b. Meiningen, 11 Nov. 1795; d. Berlin, 17 Jan. 1873. He was educated at Berlin and at Bonn. He became priva docent at Berlin in 1828, lecturer there in 1830, and from 1840 until his death he was professor of pathology and therapy. He made important contributions to knowledge of the nervous system, several of his discoveries being named for him. In methods of diagnosis of nervous diseases he made notable progress, which is detailed in his ‹Lehrbuch der Nervenkrankheiten› (1840–46; Eng. trans., Sievekind, E. H., ‹A Manual of the Nervous Diseases of Man,› 1853).

**ROMBLON,** rōm-blōn', Philippines. (1) A province consisting of a group of islands in the Visayan Sea, lying east of Mindoro and south of Luzon; they are near the centre of the archipelago, and the most northern islands of the Visayan group; area, 515 square miles. The northern islands of the group form with the islands of Mindoro and Marindique clear, deep channels, much frequented by Philippine boats; the islands are also indented with well-sheltered inlets and bays. The majority of the inhabitants of the province are Visayans; some Negritos are found on the island of Tablas, and Manguianes in Tablas and Romblón. Civil government was established in 1901. Pop. 55,339. The islands constituting the province are as follows: (*a*) Bantón, the most northerly island of the group; the surface is rugged except in the southeast; the soil is sterile and few crops are raised; the chief industry is the mining of gypsum, an excellent quality of which is found; area, 11 square miles; (*b*) Carabao, the most southern island of the province; its chief physical characteristic is a central cone-shaped summit, from which the land slopes regularly to the sea; it is heavily wooded, but not inhabited; area, 19 square miles; (*c*) Dos Hermanas, two islets of rock, separated by a channel two miles in width; area, one square mile; (*d*) Maestre de Campo, the most western island of the province; it is circular in shape and mountainous with steep shores; it contains one small village on the east shore; area, three square miles; (*e*) Romblón, the third island in size, giving its name to the group on account of central location and mineral wealth; (*f*) Sibuyán, the second largest and most eastern island of the group (see Sibuyán), and (*g*) Tablas, the largest island (see Tablas).

(2) An island of the province of Romblón, lying midway between Sibuyán and Tablas, on the route of steamers passing through San Bernardino Strait and Verde Passage; area, 50 square miles. A central mountain range traverses the island from north to south, with spurs extending toward east and west. The chief occupation of the people is cattle raising; valuable deposits of quartz, marble and slate are found and quarried; the marble is exported in large quantities. This island is the seat of government for the province.

(3) Pueblo, capital of the province of Romblón, situated on the northwestern coast of the island of Romblón, the largest town of the province; it has an excellent harbor, one of the best of the Visayan group, and is the commercial center of the island. It has some old

fortifications originally built to defend it from pirates. Pop. 6,764.

**ROME,** Ga., city and county-seat of Floyd County, picturesquely situated at the junction of the Oostanaula and Etowah rivers, which at this point form the Coosa River. It is situated 72 miles northwest of Atlanta, 195 miles northeast of Selma, Ala., and 73 miles southwest of Chattanooga. Rome is on the Central Railroad of Georgia, the Southern Railway, the Western and Atlantic, and the Rome and Northern, the Nashville, Chattanooga and Saint Louis railroads. Both the Coosa and Oostanaula rivers are navigable. Rome has many modern business blocks, handsome churches and public buildings. Shorter University for Women is here located. It also has a United States post office and courthouse, opera-house, fine school buildings, municipal and library buildings, and national and State banks. There is a large and increasing trade here in cotton manufacturing and general merchandise. In the city and contiguous thereto are numerous cotton mills, planing mills, furniture factories, iron foundries, plow and scale works, ice mill, cottonseed oil mill, sash and door factories, tanneries, twine works, brickyards, sewer pipe works, tents, awnings, boxes and crates, mattresses and other smaller industries. The assessed property valuation of Rome is over $6,000,000. Rome was incorporated as a city in 1847 and is governed on the commission plan since 1915. It has an electric light plant and waterworks and a street railway system. Pop. (1920) 13,252.

**ROME,** the capital of the Roman republic and empire, the Holy See, and of the kingdom of Italy since 1871, is in 41° 53′ 54″ N. latitude (more than a degree further north than New York City) and 12° 28′ 50″ E. longitude from Greenwich. Pop. about 539,000. Its nearness to the Mediterranean on the south and the Apennines on the east strongly influence its climate. The average temperature in winter is 49½° F. and in summer 74½° F. Snow, ice and frost are infrequent. Foreigners regard the summer as rather oppressive, but as there is both a mountain and a sea breeze the nights are reasonably comfortable except in July. The Tramontana wind from the Alps is bracing but menacing to those not warmly clad. The sirocco from the African desert is enervating and productive of nervous disorders — a fact recognized by the old law in Rome and held «an attending circumstance» in cases of crimes of blood. The city is efficiently drained by means of some of the ancient *cloacæ* and by modern culverts; intramural burial is no longer practised; the streets are well cleaned; the plumbing is of the best type; slaughter-houses have been abolished and the abattoir substituted; meat, fruit and vegetables are rigidly inspected, and in all respects the sanitation has been so careful that the death rate has been reduced from 30 to 19 in the thousand. The Acqua Marcia (built 140 B.C.; restored 1869) brings water from the Sabine Mountains, a distance of 56 miles. Although strongly impregnated with lime, the water is pure and excellent.

The city is situated on both sides of the Tiber about 16 miles from its contact with the sea, surrounded by the Campagna, the vast prairie stretching from the Mediterranean to the Alban Mountains and the Sabine Hills, the granary of Rome and the grazing country from which are drawn, in large part, its supplies of meat, milk and butter. Measured by its extent, but a small part of the city is on the right bank of the river. This Transtiberine part — in two sections, the Borogo and the Trastevere — extends over the low ground beneath the Vatican Hill, north of the ancient Janiculum. This eminence is crowned by the Vatican, the residence of the popes, the largest palace in the world, containing more than a thousand rooms, halls and chapels, and covering more than 13 acres. The Vatican, the Lateran and the Castello Gandolfo are outside of civic jurisdiction.

South of the Vatican is Saint Peter's, on the site of Caligula's circus, the scene of the torture of Christians by Nero. This chief shrine of Roman Catholicism (described hereafter) is the largest church in the world and occupies nearly four acres. It had its beginning as a basilica erected by Constantine. In the course of its development it came under the creative genius of Michelangelo and received from him its most striking feature, the great dome. Saint Peter's tomb is under the high altar.

The Rome on the right bank of the Tiber is of modern development and is the home of the working class, by speech and appearance somewhat differentiated from the people of the Rome of the left bank. The Tiber enters the city from the north and issues from it at the southwestern base of the Aventine eminence. In its course of three or four miles it is spanned by 11 bridges.

Modern Rome on the left bank occupies the plain anciently known as the Campus Martius, north of the seven hills of the regal and republican city. The Piazzo del Popolo is to Rome, in a measure, what the Place de l'Etoile is to Paris. From it radiate great arteries of distribution of the city's out-door throng and traffic. The chief of these is the Corso Umberto I, called simply the Corso, leading, along the western base of the Pincio, to the Capitoline and to a panoramic view of ancient Rome beyond the hill. It is the successor of the ancient Via Lata and is continued north of the city by the Via Flaminia. The Via Fernandino di Savoia runs due west from the piazza, crosses the Tiber at the Ponta Margherita (the northermost bridge within the city) and is continued by the Cola di Rienzi to the Vatican. The Via di Ripetta, passing southward from the Piazza del Popolo, parallels the river and unites with the Via della Scrofa where the Senate sits, in the Palazzo Madama. The Via del Babuino leaves the Piazza del Popolo on the left or east side of the Corso and ends at the Piazza di Spagna and the English quarter, into which the Scala di Spagna descends (137 steps) from the SS. Trinità de' Monti. From this Piazza the Via del Babuino continues to the Quirinal and thence, through a tunnel, to the Esquiline.

The Piazza di Venezia, in which the Corso terminates, is the tramway centre of the city. On the southern side of this square is the imposing monument to Victor Emmanuel II, after designs by the late Count Sacconi, rising in the centre of a colonnaded platform to a height of more than 200 feet. The platform is approached by massive flights of steps. The monument was a quarter of a century building and cost about 25,000,000 francs. From the Piazza di Venezia the broad Via Nazionale runs a general course northeast between the Quirinal and the Viminal Hills to the Church of Santa Maria degli Angeli, a minute's walk from the railway station (Stazione di Termini), opposite the Baths of Diocletian. In the reverse direction this great street is continued — under the names of the Via del Plebiscito and the Corso Vittorio Emanuele — westward to the Tiber opposite the Villa Barberini. In a fairly accurate way it is the boundary between the area of ancient Rome and that of the modern city on the left bank of the river. Important streets south of this line are the Via Cavour and the Via Alessandrina, which pass the site of the Forum of Vespasian; the Via S. Teodoro (the Vicus Tuscus), traversing the ancient Velabrum; the Via dei Cerchi between the Palatine and Aventine, running through the site of the Circus Maximus, and the Via di Porta S. Sebastiano, touching the tomb of the Scipios and the arch of Drusus, and ending at the ancient gate to the Appian Way. Other important squares and streets: the Piazza Barberini adjacent to the Palace; the Piazza Colonna in the centre of the city, with a column of Marcus Aurelius, and nearby the Piazza di Monti Citoria, on which stand the Chamber of Deputies and other government offices; the Piazza San Pietro with its artistic colonnade, in front of Saint Peter's, and the Vatican; the Piazza di Navona with a fountain and two churches; the Piazza del Campidoglio in front of the Capitol, having the perfect equestrian statue of Marcus Aurelius, celebrated as winning Michelangelo's special regard; the Piazza di S. Agnese, a martyred saint; the Piazza di Navonna, containing the famous statue, a noble Greek work of Pasquino (hence the term «Pasquinades») where for a long time satires of the day, directed against the Pope or nobility and prevalent follies, were posted; the Piazza di Montanari, where from time immemorial peasants contracted with landowners for the season's farm-work; and in the new quarter, embracing the Esquiline, Viminale and a portion of the Pincian Hill, besides the Independenza, are the Piazza di Dante, Vittorio Emanuele, Esquilino, Guglielmo Pepe, etc.

Before the railroad was built most travelers entered Rome by the Porta del Popolo, at the northern extremity of the city and but a short distance from the piazza of that name. Those bound for Tuscany depart thence along the Via Flaminia. Just outside is the Villa Borghese, officially styled Villa Umberto Primo since its purchase and transfer to the city as a public park.

The Porta Pinciana is less than a mile east of this gate, and the Porta Pia is a half mile still further on, along the Corso d'Italia. The Via Venti Settembre begins at the Porta Pia, near which the Italian troops entered Rome Sept. 20, 1870, and runs to the heart of the city near the Quirinal. From this gate the Via Nomentana leads across the Anio to Mons Sacer, where the plebeians took refuge during the secession movement which ended in the recognition of popular rights. A mile south is Porta San Lorenzo, the ancient Tiburtina, from which excursions leave Rome for Tivoli. Along a lane inside the wall, going south across the railroad, one reaches the Porta Maggiore, which was originally an archway in the Acqua Claudia (A.D. 52), which brought water from Subiaco, 42 miles from Rome. Palestrina is reached from the gate over the ancient Praenestina. The Porta S. Giovanni is the gate of departure from Naples, and the Porta S. Sebastiano, the southernmost gate of the city, is the port of departure for the tombs and other places of interest along the historic Appian Way.

**Government.**— The government of Rome is administered by a communal council, a municipal council and a syndic. The municipal council is a modified board of public works and the syndic is the administrative chief; both are elected by the communal council from the membership of that body. The syndic is a member of the government. The executive power of the state belongs exclusively to the sovereign and is applied by ministers, of whom there are 13, one without portfolio: The Interior, Foreign Affairs, the Colonies, Justice and Ecclesiastical Affairs, the Treasury, Finance, War, Marine, Public Instruction, Public Works, Agriculture, Industry and Commerce, and Posts and Telegraphs. The legislative authority is the joint concern of king and Parliament. Parliament consists of the Senate and the Chamber of Deputies, the former composed of the princes of the royal house, who are over 21 (they may not vote until they are 25 years of age), and of an unlimited number of members over 40 who are nominated for life by the king. The total membership usually exceeds 400. The House of Deputies has a larger membership, now somewhat more than 500. The number is determined by the population — one deputy to every thousand. The Parliament sits in the Camera de' Deputati, in the Piazza Colonna. The Quirinal Palace is the residence of the royal family and the chief government bureaus are on the Quirinal Hill or near by.

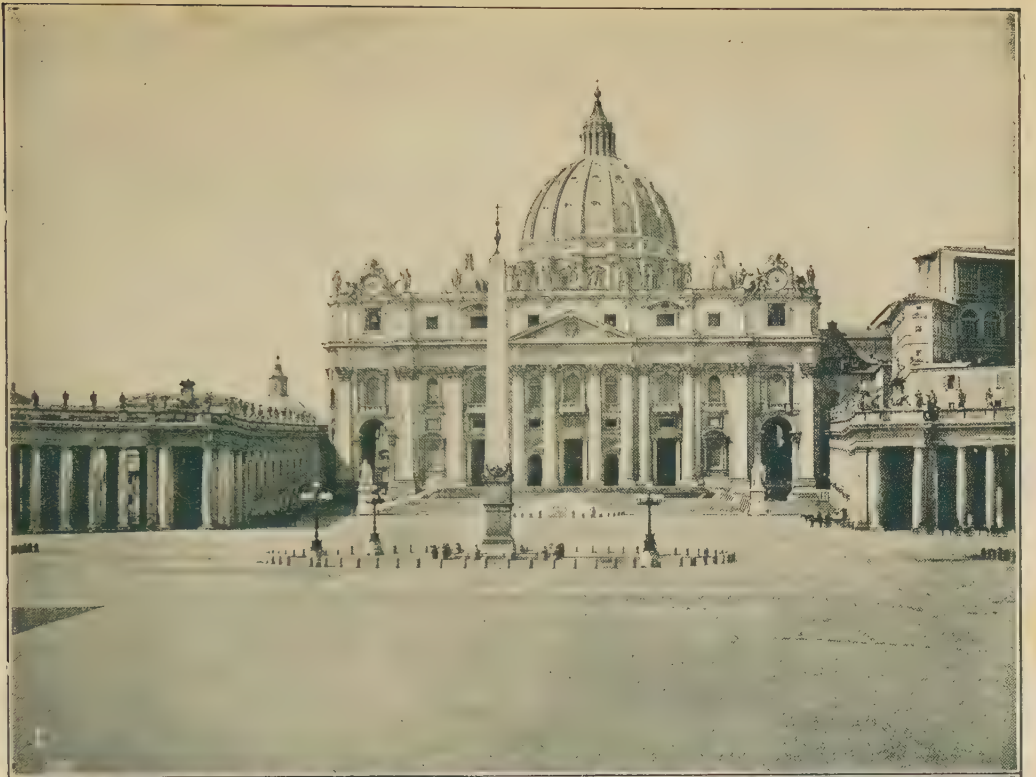
**Religion, Churches, etc.**— The Roman Catholic Church is in name the ruling religion, but church and clergy are subordinate to the civil government, which guarantees freedom of worship. The law of 1873 abolished the legal status of religious corporations, and they cannot hold property. The revenue from lands destined for charity or schools is now administered by the city, and by each commune; the income from monastic parish church property in Rome belongs to the parish churches, and that from property of foreign religious orders in Rome — about $80,000 — goes to the Holy See. Saint Peter's and its precincts, the Vatican Palace and Saint John Lateran belong to the jurisdiction of the popes. More than 95 per cent of the population of Italy is Catholic. Rome is a city of churches. Any good guide book records more than a hundred as worthy of a visit. Among those of most ancient foundation still in use are Santa Pudenziana, traditionally the oldest, dating from Saint Peter's establishment of a place of worship in the house of Pudens; S. Maria, in Transtevere, founded in the beginning of the 3d century; San Paolo, Fuori le Mura, on the spot where the body of Saint Paul is entombed, S. Agnese, and S. Lorenzo Fuore, all credited to Constantine. Saint Peter's, of course, ranks first among Roman churches. It was founded by Constantine on the site of the Circus of Caligula, where Saint Peter suffered martyrdom, and is gorgeously decorated with gold mosaics and marble. Bramante, Raphael, and Michelangelo were the chief architects. Bernini filled it with the sculptures of his contemporaries and many monuments line the pillars and fill niches. The Pietà is one of the notable sculptures of Saint Peter's. The great dome is a marvel of architectural skill. The façade is 357 feet long and 144 feet high, and over the central entrance is the loggia, where the Pope is crowned and whence he gives his Easter benediction. Over the main entrance of the vestibule is the celebrated Mosaic of the Novicella (1298), by Giotto and Cavallini. The magnificent central door of bronze is a remnant of the old Basilica (1431–39). The enormous size of statues and ornaments in Saint Peter's are deceptive as relates to the vast proportions of its interior, which is only realized by observing the moving, living figures of people. Around the shrine under the dome, 86 gold lamps burn continually. Wonderful mosaic pictures are among the countless gems which enrich this noble temple. Its interior has the form of a Latin cross with chapels on the sides. Many princes of the church lie buried in the crypt. The Vatican, the present residence of the popes, is a vast collection of palaces, comprising the old and new palaces of the popes, the Sistine Chapel, the Loggie and Stanze, the picture gallery, museums and library. Raphael's wall frescoes rank above all his other work, and in the ‹School of Athens› and ‹Disputa,› the ‹Transfiguration,› ‹Driving Heliodorus from the Temple,› and other frescoes of the Stanze and Loggie, he evinces astonishing theological wisdom and philosophical erudition. Each stanza attests to his deep reflection and rich imagination; detail and general effect are equally studied, resulting in a perfect harmonious whole. In the Sistine Chapel, the ‹Last Judgment› is Michelangelo's chef d'œuvre.

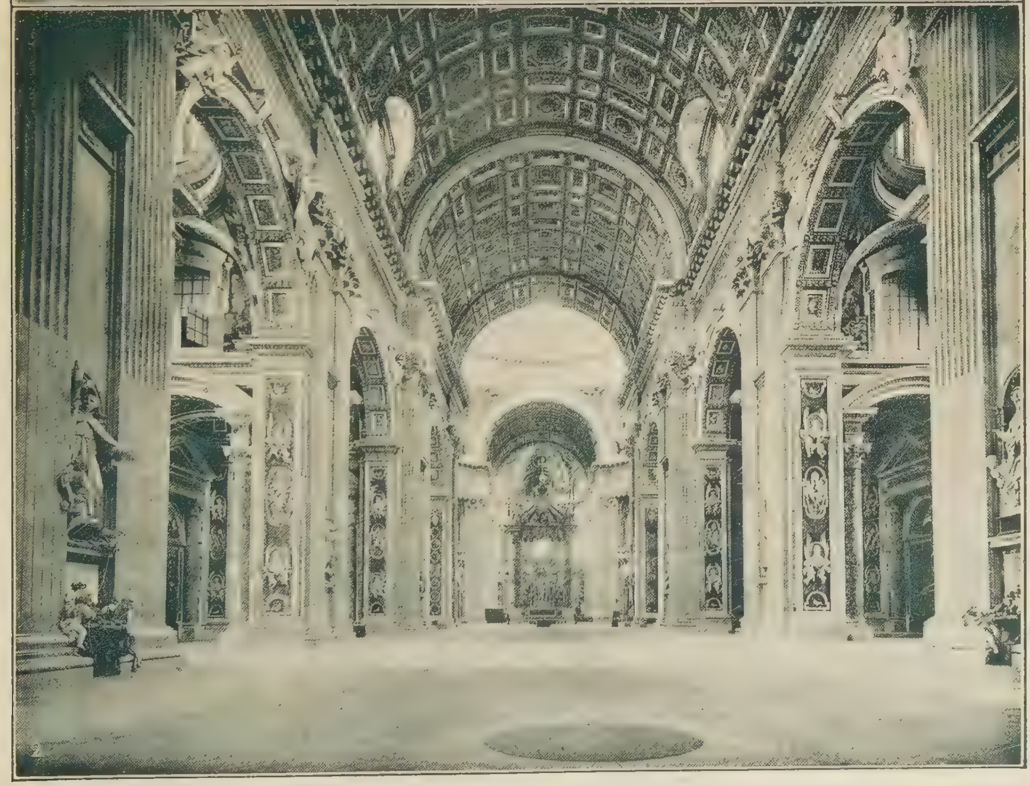
S. Giovanni in Laterano, on a lonely site near the south wall, was built by Constantine, but has since been rebuilt, altered and extended by Giotto and others under various popes, and the high church councils are held there. Other churches are S. Maria Maggiore, in whose construction antique bronzes, gold and marble from pagan temples were largely used, also beautiful mosaics of the 6th century. S. Croce, erected by Saint Helena, the nave of which was borne by eight antique columns; Saint Clemente, the most perfect specimen of old basilica, contains frescoes by Masaccio; Il Gesu, the principal church of the Jesuits, with the façade and cupola by Giacomo della Porta, and whose interior is rich in marbles; S. Maria degli Angeli, originally a part of Diocletian's Baths, transformed into a church by Michelangelo, an imposing church, contains an altar-piece by Muziano, and a fine fresco by Domenichino, and the tomb of Salvator Rosa; S. Maria in Ara Cœli, remarkable for its architecture and very old; S. Maria in Cosmedin at the north base of the Aventine, remarkable for its Alexandrine pavement and its lofty and beautiful campanile of the 8th century; S. Maria sopra Minerva, notable as the only Gothic church in Rome; S. Maria in Dominica or della Navicella on the Caelian, with 18 fine columns of granite and two of porphyry, and whose frieze of the nave was painted in Camiean by Giulio Romano and Perino del Vago; S. Maria della Pace, interesting for its paintings, particularly the four sybils, considered among the most perfect works of Raphael, and S. Maria del Popolo, notable for its sculptures and paintings (‹Jonah› by Raphael, ceiling frescoes by Pinturicchio, and mosaics from Raphael's cartoons by Aloisio della Pace). In S. Pietro in Vincoli is the celebrated ‹Moses› of Michelangelo, by some critics regarded his best work of sculpture.

The Catacombs are subterranean passages, extending many miles by winding passages underground, used as sepultures and meeting places by the early Christians; niches in the walls of tufa were used to bury their dead. The passages are narrow, except occasionally when they open into wider spaces used for chapels of worship, and often frescoed. The decoration is characteristic and significant, usually representing Christian hope and doctrine. Pictures are frequently symbolic. A large collection of sarcophagi, pictures and inscriptions from the catacombs, are preserved in the Lateran Museum. The catacombs extend around the city in a wide circle; the most important are the Catacombs of Calixtus on the Via Appia; those of Domitilla or Saints Nereus and Achilleus; Saint Prætextatus, Via Appia; Saint Priscilla, beyond the Porta Salara; Saint Agnese, Via Nomentana; Saint Sebastiano, beneath the church of that name; Saint Alessandro; and the Jewish Catacombs and those of Mithras of the Via Appia. Among the finest sepulchral monuments, the chief were the Mausoleum of Augustus in Campus Martius, and that of Hadrian on the west bank of the Tiber, now the fortress of modern Rome, known as the Castle of San Angelo.

**Schools, Libraries, etc.**— The state controls public instruction. There are four grades: Elementary; secondary, classical; secondary, technical and higher education. Elementary instruction is provided with religious tuition, if the parent request it; otherwise, without. Great Britain, America, Germany and Austria maintain schools of history, art and archæology. France's Academy of Art is in the Villa Medici. The University of Rome or Collegio della Sapienza is an ancient institution; canon law and civil law, medicine and philosophy and philology are included in its curriculum. It possesses extensive laboratories, botanical gardens and an astronomical observatory. It is attended by nearly 1,000 students. The Collegio de Propaganda Fide is situated in the Piazza di Spagna; the Collegio Romano, adjacent to Saint Ignazio, is a lyceum, and now contains the Archæological Museum and the recently established library, Biblioteca Vittorio Emanuele. The Accademia de' San Luca, for the promotion of the fine arts, is composed of painters, sculptors and architects, and was founded in 1595. Connected with it are a picture gallery and schools of fine arts. There are numerous other institutions connected with art, music, science or learning, one of which the Accademia de' Lincei, founded in 1603 by Galileo and his contemporaries, is the earliest scientific society of Italy. The American College, founded about half a century ago, is a school for priests and is composed of students who desire a post-graduate course in divinity, philosophy, rhetoric, metaphysics, etc. The students

# ROME, ITALY

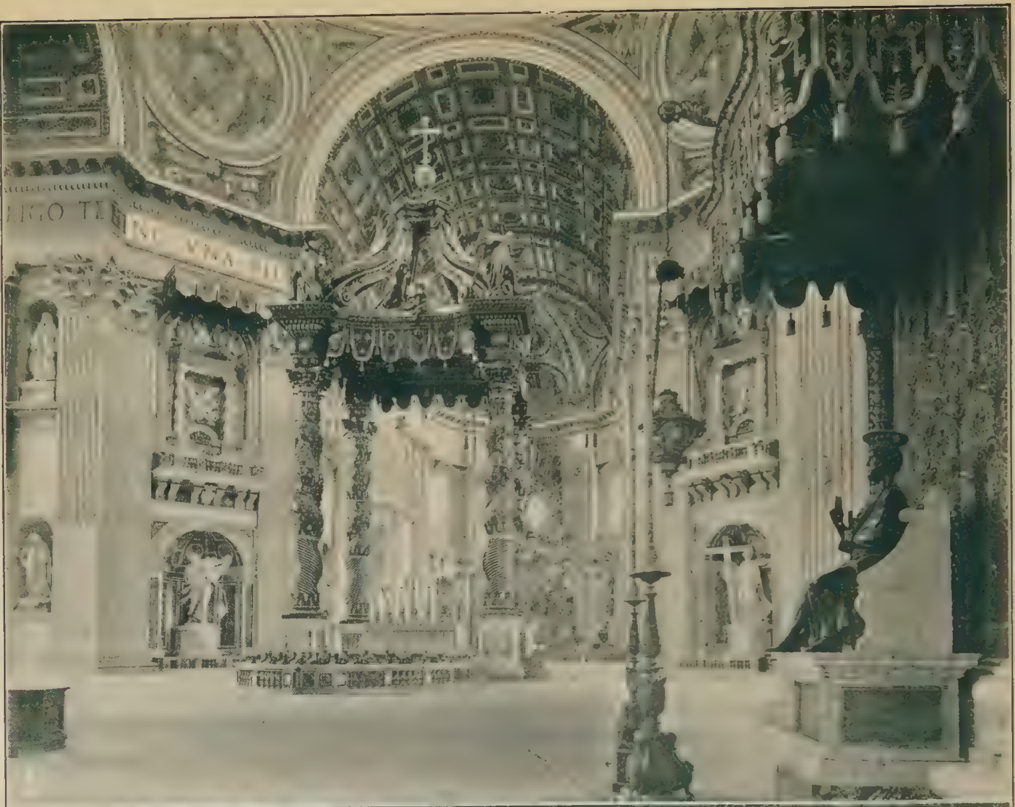


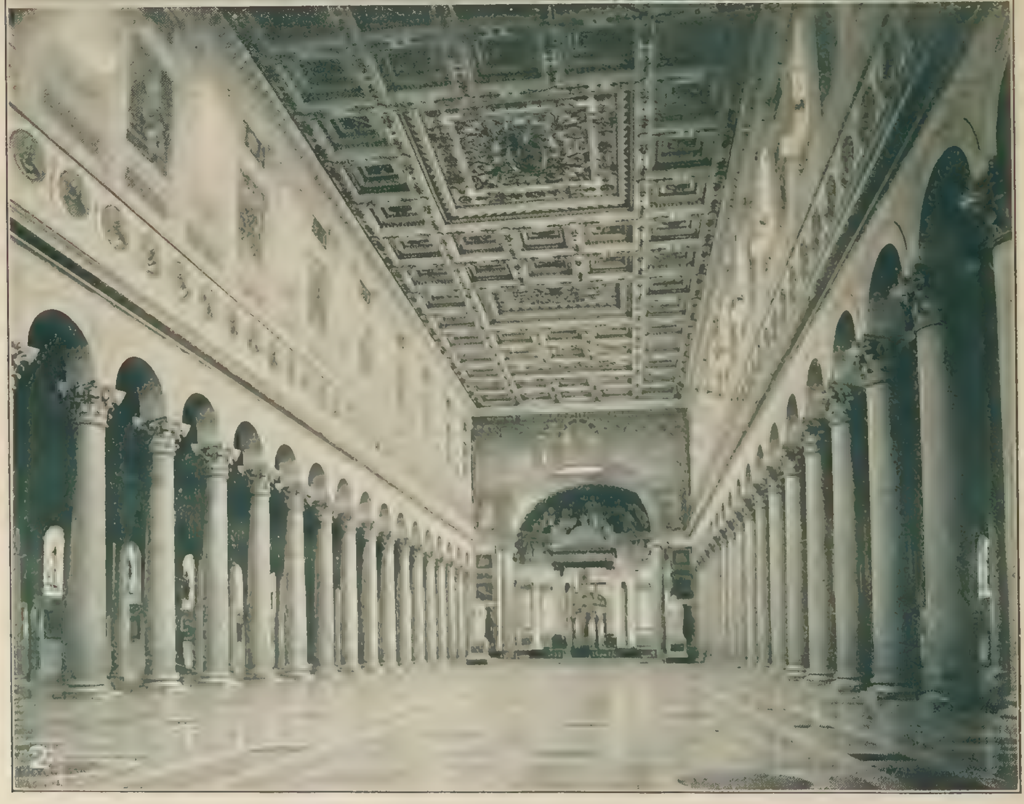


1 Facade of Saint Peter's

2 Interior of Basilica of Saint Peter's

ROME, ITALY





1 Interior of Saint Peter's

2 Interior of Saint Paul's

enjoy special privileges in the Vatican Library and museums and at all great church functions. There is also an American school of classical studies, under the auspices of the Institute of Archæology, whose work consists of archæological research and study, and whose investigations often lead the students as far as Greece or Egypt, accompanied by the faculty. The Irish College is the oldest in Rome.

The Vatican Library — Biblioteca Apostolica Vaticana — possesses more than 250,000 volumes and 34,000 manuscripts. Its priceless treasure is the *Codex Vaticanus,* containing all of the Bible as far as Hebrews ix, 14. Scholars regard it as probably the oldest vellum manuscript in existence. The *Codex* was entered in the first catalogue of the library, dated 1475. The most recent significant acquisition was the Biblioteca Barberiniana, at a cost of $100,000. This library is nominally in the charge of a cardinal, but the actual administration is by an under librarian and a prefect. The largest collection — more than 350,000 books and 6,200 manuscripts — is the Biblioteca Vittorio Emanuele, in the Collegio Romano. It was formed in 1871 of the libraries of the Jesuits and suppressed convents, to which large additions are made annually. The Biblioteca Alessandrina, in the Università della Sapienza, possesses 160,000 volumes, the Biblioteca Casanatense, in the monastery adjoining S. Maria sopra Minerva, 112,000, and the Biblioteca Angelica, in Sant Agostina, 80,000. A half dozen private libraries are open to the public.

**Palaces.**— It is probably true, as claimed, that Roman palaces are unequaled elsewhere in the world for spaciousness and splendor. Their lofty portals, broad marble stairways, and great halls are matters of wonder. The description by Gibbon applies to-day: «The most costly monuments of elegance and servitude, the perfect arts of architecture, painting and sculpture have been prostituted in their services, and their galleries and gardens decorated with the most precious works of antiquity which taste and vanity have prompted them to collect.» The Palazzo Barberini, on the Quirinal, was built by Urban VIII, almost wholly from materials taken from ancient buildings. In its small but excellent collection is the ‘Beatrice Cenci’ by Guido Reni — also valuable manuscript and some literary curiosities; the Palazzo Colonna near the centre of the city; the Palazzo Corsini in the Trastevere, once the residence of Queen Christina of Sweden, and containing precious manuscripts; the Palazzo Farnese, near the Tiber, was inherited by the kings of Naples, but now belongs to the French government, and is occupied by the ambassador. The Spada Palace is one of the finest examples of the late Renaissance; the Palace Rospigliosi, near the Palace of the Quirinal, contains valuable art treasures. On the ceiling of a casino in its gardens is the beautiful fresco of the ‘Aurora’ of Guido — this is now the residence of the French Ambassador to the Pope; the Palazzo di Venezia is adjacent to the principal Jesuit church, Il Gesù. In the Corso Vittorio Emanuele is the splendid Palazzo della Cancelleria, the single palace in the city which the Pope is permitted to own. On a part of the site of the theatre of Pompey is the Palazzo Pio, and southwest of it the fine 16th century Palazzo Farnese.

**Ancient Rome.**— Counseled by the gods, the Greeks conquered Troy. Æneas, carrying his father on his shoulders and leading his son Ascanius, fled, and, guided by his mother Venus, reached Latium. In time Ascanium built a city on a hill, which he called Alba Longa, and his descendants reigned there as kings for 300 years, with all the Latin towns as vassals. But one of his descendants — Procas, king of Alba — dying, left two sons who quarreled over the throne. Amulius, the younger, seized the power, and made his brother Numitor's daughter, Rhea Silvia, a Vestal to avoid the birth of a claimant to the throne. The gods decreed otherwise. She was loved of Mars and bore twins, which Amulius the king ordered to be thrown into the Tiber. They were saved, and suckled by a wolf until they came under the care of Acca Laurentia, wife of the shepherd Faustulus, who reared them. In time they slew the usurping king, placed their grandfather Numitor on the throne, and went away from Alba to build a new city on one of the seven hills by the Tiber. Being twins, neither had the right of primogeniture, and a quarrel ensued over the naming and the governing of the city to be. They left the decision to the sacred birds, and awaited a sign, Romulus (q.v.) on the Palatine Hill and Remus on the Aventine. Remus saw the vultures first — six of them; but Romulus saw 12. Accordingly Romulus built the city, named it Rome for himself, drew a furrow around it with the sacred plow, and beside the furrow built a wall and dug a trench. Remus ridiculed his defenses, and leaped over the wall and the trench to show that the town might easily be taken. Romulus slew him, saying: «So be it with anyone who dares to cross these walls.» And so Rome was founded 753 years before the birth of Christ.

These stories of the founding of the Eternal City, once given a certain value as history, Niebuhr, Mommsen and their successors have dismissed to the limbo of myths that have no claim on the credulity of seekers after truth. Even Dionysius (i, 29) reported the skepticism of authorities before his day who claimed that there existed on the Palatine Hill, previous to the time of Romulus, a Siculian, Pelasgian or Tyrrhenian town whose name was probably Roma. And Microbius (Saturn iii. 9) avers that it was the belief of the Romans themselves that Rome, the city's name, was not Latin and that its Latin name was kept a sacred secret.

Whenever and however Rome had its beginning, its inception was on the Palatine Hill, the centre of a group of eminences of slight elevation on the left bank of the Tiber. The Palatine was not a large stage for so vast a drama of world history as developed there, its circumference being less than a mile and its elevation above the Tiber but little more than a hundred feet. The area of the hill is less than a 20th of that of Central Park, N. Y. It was the home of the Ramnes, who were regarded as the original Romans; a tribe of uncertain origin, but probably of the Opican stock. The form of the so-called city of Romulus — that of a trapezium — forced upon it by the contour of the hill, procured for it the name Roma Quadrata. This early city was enclosed by the wall credited to Romulus, which began on the western edge of the Palatine opposite the S. Giorgio in Velabro, ran thence southward in such wise as to enclose the site of the church of S. Anastasia and the declivity of the valley of the Cerche under the southern slope of the Palatine, along the eastern edge of the Palatine opposite the Cælian Hill, then along the Sacra Via close to the Arch of Titus to the Forum Romanum near S. Marie Liberatrice, and thence to the beginning. Within this enclosure were the temples of the gods and the homes of the patricians; the commons lived beyond the walls with only incidental protection from the fortress within. There was little room for growth. Imperial expansion began with Augustus, who lived in the house of Hortensius until it was burned. Then the Romans, building him a palace worthy of his state — it covered the sites of the houses of Cicero, Hortensius, Catiline and Clodius — really began the «Palace of the Cæsars,» which spread over the entire hill, and, before the day of its decline, extended beyond the Romulan wall to two other hills, the Cælian and the Esquiline. Tiberius extended the palace toward the edge of the hill above Velabrum (the riverside marsh), Caligula toward the Forum Romanum, connecting it with the capitol by a bridge, and converted the temple of Castor and Pollux into a vestibule for it. Nero built it toward the Colosseum and filled the valley between the Cælian and the Palatine with the over-grown structure.

The Cælian Hill, southeast of the Palatine, was inhabited by the Luceres, a tribe of supposed Greek origin. It was the site of the Campus Martialis, the playground of Rome whenever the Campus Martius was flooded by the Tiber. It is more than three times the size of the Palatine, and, because it was covered with oaks — a part of which made the sacred wood of the Camenæ — it was known as Mons Querquetulanus. The Cælian figures, in the history of Rome, less than the other hills. Originally the home of a dense population, it was later long given up to the monks of the Camaldolese, Passionist and Redemptorist orders and the Augustinian nuns of the Incoronati. New streets have now been opened and settled.

The Esquiline, ‹Hill of the Beech,» a tree sacred to Jove, is directly north of the Cælian across the ancient Subura. It has two elevations or summits rising from a common plain — one summit, known as the Oppius, now occupied by the churches S. Pietro in Vincoli and S. Martino al Monte, and the other as the Cipius, now the site of S. Mary Major's. It is the largest of the Roman hills. Temples dedicated to Fever (near S. Maria Maggiore), Juno Mephitis (near a malarial pool), and to Venus Libitina for the registration of deaths, bear testimony to the insalubrity of the Esquiline. On the slope behind the Forum was the fashionable quarter called the Carinæ, on the site of the present Via del Colosseo. Near here the Senate sat occasionally in the Temple of Tullius. Pompey's home was here; and near this patrician quarter of the hill was the already mentioned Subura — in the valley formed by the convergence of the Esquiline, the Quirinal and the Viminal — the plebeian quarter, to this day the scene of a crowded population. Virgil lived on the Esquiline, Maecenas, patron of Augustan poets, had his home where the baths of Titus stood later. To-day only the northern side of the hill is inhabited; the southern is covered with vineyards and gardens and ruins.

The Capitoline, the smallest of the seven hills, is less than five minutes from the Palatine, in a northwesterly direction. It had but one building devoted to secular affairs, the record office (Tabularium), but many pagan temples. It was the home of Saturn, the predecessor of Jupiter in the city's legendary story, and was called successively Saturnium, Mons Tarpeius and Capitolium, or Mons Capitolinus, the Hill of the Skull. There were two summits; one the citadel or Arx, the other the site of the earliest temple mentioned by any classic author — that of Jupiter Capitolinus, built under Tarquinius Superbus, 535 B.C., with money taken from the Volscians in war. This sumptuous fane had peculiar claims on the veneration of Roman citizens — it was citadel and shrine combined. The Sybilline books were preserved there. There both Titus and Vespasian celebrated their triumph over the fall of Jerusalem. It was later robbed of its treasures during invasions of the Vandals. Near it stood the temple of Fides and the twin temples of Mars and Venus Erycina. The temple of Jupiter Tonans was built by Augustus; the temple of Honor and Virtue by Marius in 103 B.C., with spoils taken in the Cimbric wars. There were still other notable temples, and the Altar of Jupiter Pistor, commemorating the stratagem of the Romans, who threw down loaves into the camp of the besieging Gauls to deceive them as to the state of their supplies. On this hill Petrarch received his laurel crown, and the tribune Rienzi promulgated new laws. Michelangelo designed the present museum and palace of the conservatories. The Museo Capitolino contains one of the finest collections of statuary and painting, and the famous mosaic, Pliny's Doves, found in the ruins of Hadrian's Villa near Tivoli. In «The Reserved Cabinet» stands the exquisite Greek statue Venus of the Capitol, found immured in a wall upon the Quirinal. In the Hall of the Emperors is the imposing seated statue of Agrippina (grand-daughter of Augustus) and 83 busts of Roman emperors, empresses and their families, a character study. The Hall of Illustrious Men is interesting, as is also the Hall of the Faun, from the Faun found at Hadrian's Villa. The statue of the Faun is highly graceful and artistic. The three gems of the collection are found in the Hall of the Dying Gladiator,— the Dying Gladiator, the Antinous of the Capitol and the Faun of Praxiteles. The Palace of the Conservatories contains busts of artists by Canova, the restoration of a column of Michelangelo, many fine frescoes and reliefs by Bernini and other masters; the Apollo Belvedere and the famous Bronze Wolf of the Capitol, of unknown antiquity. Near the wolf is the well-known and beautiful figure of the boy extracting a thorn from his foot. The Picture Gallery of the Capitol contains few good works: a beautiful Saint Sebastian by Guido and several others by Guercino.

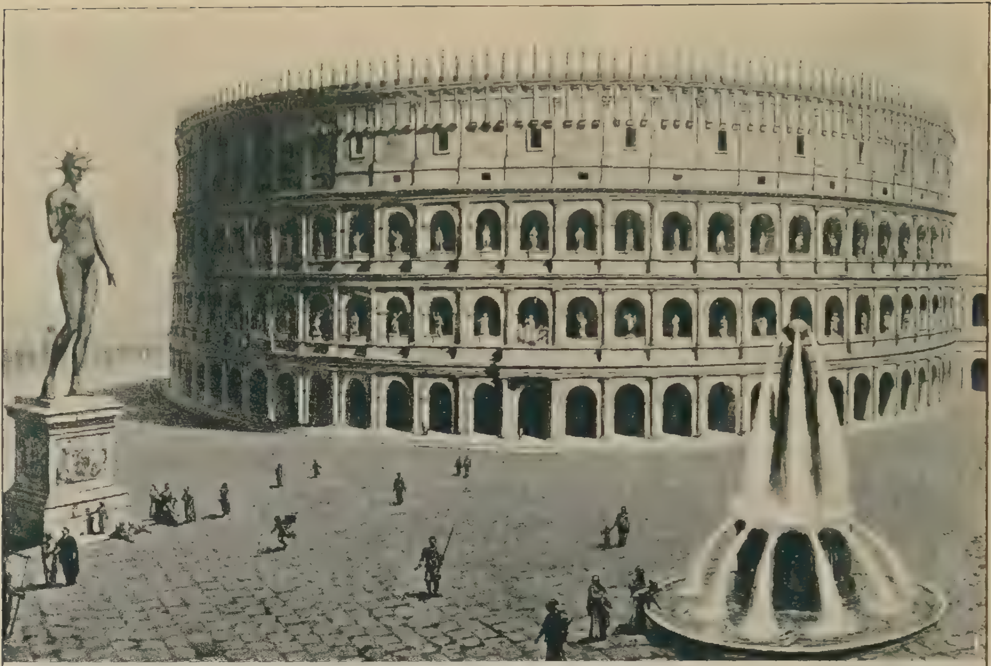
The Capitoline was the seat of administration — the Capitol. State acts, deeds, documents, etc., were advertised there by hanging or «posting» copies, engraved on bronze, on a statue or shrine.

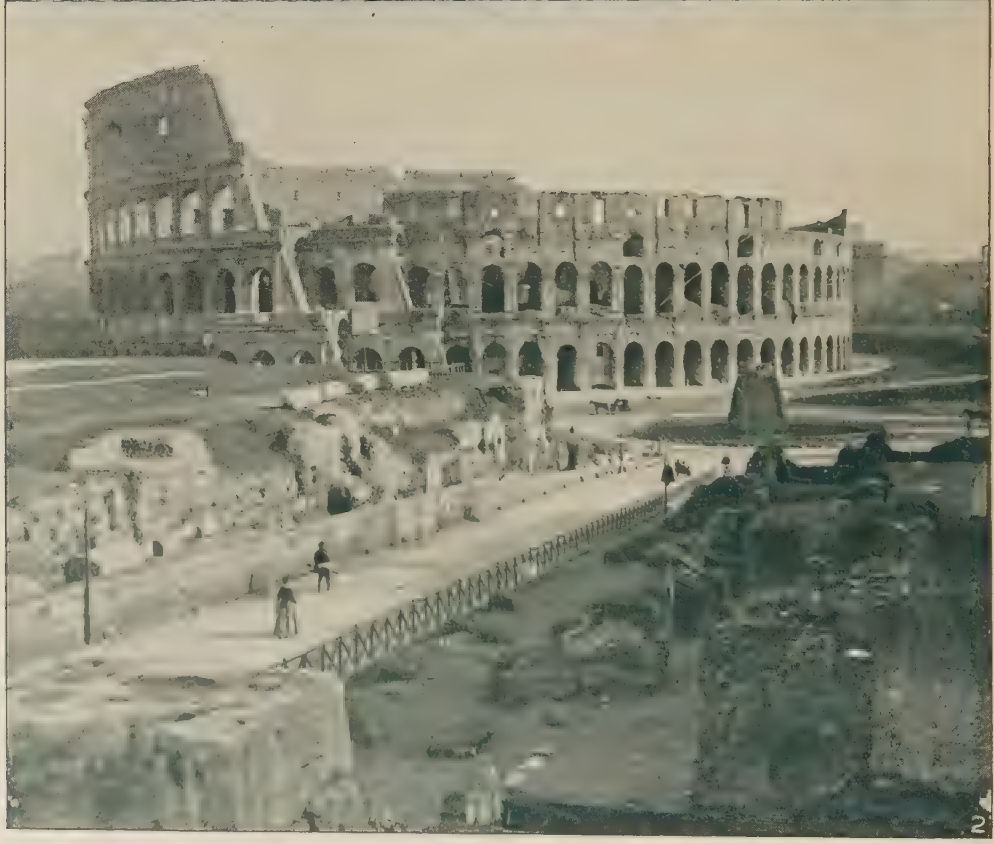
The Quirinal, the northernmost of the seven summits, is a long narrow eminence beginning at the Forum of Trajan, at the base of the Capitoline and stretches northeastward toward

Piazza Navona, or Circus Agonalis

Plazza Del Popolo, Saint Peter's in the distance

# ROME, ITALY





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1 The Coliseum — Restored

2 The Coliseum — Present Condition

the Porta Pia. It was the site of the Temple Janus Quirinus (a Sabine god) surrounded by a sacred grove. Here Martial, the epigrammatist, lived in a third floor apartment in a narrow street and greater folk had their palaces — the Flavii and the Cornelii — at some number in the Vicus Corneliorum. In Trajan's time the Quirinal was joined to the Capitoline by a steep, high ridge which sloped to the Forum Romanum on the southeastern side and to the Campus Martius in the opposite direction. Trajan cut it away. The building of chief importance on this hill is the Quirinal Palace erected to be a summer residence of the popes. It is now the palace of the king.

The Viminal, like the Esquiline, was outside the Servian wall, adjacent to the Quirinal and in appearance a part of it, except when viewed from near S. Maria Maggiore. It extends to the Esquiline and gets its name from the water willows (vimina) once abundant there. The line of separation between the bases of the Quirinal and the Viminal was marked by the massive Tower of Nero (the Torre Milizie) and the walls of the Forum of Augustus. The most striking remains on the Viminal are the ruins of the Baths of Diocletian near the railway station. The great baths of Thermæ were peculiar features of the city and were used not only for bathing purposes, but for games and athletic sports and contained assembly rooms, libraries, promenades, etc. The thermæ of Caracalla, Titus and Diocletian were the most magnificent and largest.

The Aventine Hill takes its rise from where the old Sublician bridge spanned the Tiber and extends to the Circus Maximus, which separated it from the Palatine. The name was derived from King Aventinus Silvius, according to the most credited but still disputed etymology. It is the highest and most picturesque of the hills. The Roman home of Saint Paul's friend Aquila was on the Aventine and overlooked the Circus Maximus. Here, tradition says, Peter and Paul taught the Christian faith in an oratory discovered in 1776 near the present church of S. Prisca. Aquila and Priscilla were buried in the cemetery of Priscilla, which was also the burial place of Pudens, whose house was on the southern slope of the Viminal, where its remains were discovered in 1870. The *Liber Pontificalis* confirms the tradition that pieces of furniture used by Saint Peter were long preserved in the house and church of Pudens.

There were other hills of profound interest to students of the history of the imperial city. The Janiculum was the chief of these, rising abruptly on the right bank of the Tiber and declining gently into the Campagna in the direction of Civita Vecchia, the ancient Centum Vellae. Ancus Marcius, fourth of the Roman kings, connected it with the rest of the city by means of the Pons Sublicius, the first bridge over the Tiber and the scene of the defense of Rome by Horatius Cocles, who kept the bridge against Tarquinius Superbus and his Etrurian ally, Lars Porsena.

The Ramnes settled the Palatine, the Luceres the Cælian and the Sabines all the other eminences. These tribes were the three chief racial ingredients of the Roman people. The Servian wall enclosed all these hills except the Esquiline, the Viminal and the Janiculum. The Aurelian was built to extend still further the defenses of Rome, then threatened by the northern tribes. The menace of the Goth was responsible for the purpose to enclose not only the city proper, but a part of the suburbs beyond the Tiber, as a military necessity. The suburbs were at the mercy of the barbarians who had already overspread whole provinces and devastated as far as Rome, which had now descended its hills to the unenclosed Campus Martius. Aurelian, with the support of the senate, commenced the wall which bears his name in 271. The *Einsiedeln Manuscripts* (9th century) enumerate 383 towers, some of which remained until near the end of the last century, notably near the site of the Ludovisi Gardens. It also records the names of the 14 gates in this wall, of which six are in use now: Porta Flaminia, now Porta del Popolo; Porta S. Lorenzo (the ancient P. Tiburtina), Porta Maggiore (P. Praenestina), Porta S. Sebastiano (P. Appia), Porta G. Paolo (P. Ostiensis); on the Janiculum, Porta Aurelia. These gates, which disclose the course of the wall, date generally from the time of Honorius (379–395).

The population of ancient Rome has been estimated in several ways — by the extent of the area within the city wall, by the amount of corn consumed in a year, by the number of habitations, etc. What the area was is uncertain, the extent of the walls being a matter of controversy. In the Augustan period, at the beginning of our era, the consumption of corn — 60,000,000 bushels in a year — indicated a population of 1,950,000. To have housed this number — allowing 40 persons to the house — would have required 48,750 habitations; but of the actual number of domiciles at this time there is no record. Four hundred years later, in the reign of Theodosius (395–425), we have the first record of the kind, 48,382 houses. Juvenal advised the poor to emigrate from the miserable, dark lodgings, the smoke and other hardships of the city to better homes at the same price in the Italian villages. Houses were built to dangerous heights in order to accommodate the body of the Roman people and the estimate of 40 persons to each habitation may not be too large. The fact that there were no more houses in Rome at the end of the 4th century than there were at the beginning of the first should be pondered in the light of the sharp fluctuations of population which, for one reason and another, took place in the early centuries of the Christian era. Merivale's guess at the population was 300,000, Dureau Lamalle's 500,000, Gibbon's 1,200,000 and Donovan's 1,950,000. For an interesting discussion of Roman population, consult Story, 'Roba di Roma,' ch. xxi.

Public edifices rather than private, life in public in preference to domestic pursuits in the home, were bents characteristic of the Roman genius which developed a political system of collectivism — centralization, state initiative and domination. The Athenian emphasis on the individual was reversed in Rome. There the unit counted for nothing; the utilities were for the populace. Under this system a wonderful city came into being, the greatest instrument of popular service that was created before the Christian era. At the beginning of the 4th century there were in Rome, 18 public fora, 30 parks and gardens and 8 campi or commons principally used for athletics. To these are to be added the covered ways which sheltered the people from sun and rain, the colonnades and temples which served them in many ways and the public baths for their refreshment — 11 large ones and 926 small, capable of receiving 60,000 bathers at one time. Noteworthy among these were the baths of Agrippa, with the celebrated Pantheon (q.v.), the «temple to all the gods,» adjacent. Through all these utilities and many others the currents of Roman life ran from century to century of development — a well-balanced life, expanding constructively and making Rome indeed eternal, and, Jerusalem excepted, the most interesting spot on the globe.

In the fora — the kind called *venalia* — they trafficked in cattle, corn, fish; in the *fora judicialia* brokers and money-lenders pursued their calling in offices in the porticoes and buildings which enclosed them. The great forum — not the largest, but called the Forum Romanum Magnum — was built between the Palatine and the Capitoline hills. Before its founding this valley was a small lake, with a ferry; later, a morass with its wet and dry seasons — in the latter the scene of occasional battles between denizens of the surrounding hills — and finally ideally prepared for its future use by drainage accomplished through the great sewer, Cloaca Maxima, discovered in 1872. The Forum first became useful in the 6th century B.C., as the community assembling place, serving more amply than the area Capitolina which had previously been used. In view of its august history one learns with surprise how small its area was. «We say to ourselves, is it possible the Roman world, even of Cæsar's time, could have transacted its business in such restricted limits?» Its greatest length at any time, antiquarians agree, did not exceed 671 feet, its greatest width (under the Capitol) 202 and its least 117, at its eastern end. Under the empire it was but 375 feet long and 150 feet wide at the Capitoline end. It was habitually so encroached upon by the statues and monuments that the senate from time to time required it to be cleared. Lucius Æmilius Paulus, with a part of the spoils of the Gallic War, purchased adjacent property and enlarged the forum on the northern side. Cæsar, drawing on the same fund, bought more space, removed houses north and west of the Curia and gave Rome the Forum Julium. Augustus extended the area northward and Vespasian, Domitian and Nerva, each as he came upon the scene, enlarged eastward until the Forum Transitorium and the Forum Pacis were created. Trajan cut away a spur of the Quirinal on the northwest side of the Forum of Augustus and completed the development projected by Paulus and Cæsar with the vast Trajan or Ulpian Forum. «Could we from some vantage point look down and survey all these imperial fora, together with their original parent, the one forum alone now completely exposed for us, that surprise above adverted to would not partake of the nature of a disappointment. . . . We should survey a space covering many thousands of square yards, amazingly rich with temples, basilicas and columns, white with dazzling marbles and white-robed people, golden with gilt bronze statues, and here and there beautifully green with favored and sacred trees and flowers.» (Baddeley).

On the east side of the Forum, Tullius Hostilius enclosed a space called the Curia, in which the senators, representing patrician Rome, held their meetings; in front of it, in another enclosure, the Comitium, the plebeian vote was polled. From the senate house a flight of steps led to that part of the Comitium where the Rostra stood, from a near-by platform of which foreign ambassadors (Greek) listened to orators in the Rostra and speakers in the Comitium. The Rostra was a simple platform, under an arcade, to which the bronze beaks (*rostra*) taken from captured vessels were attached.

The Forum was connected with the Summa Sacra Via (the ridge between the Colosseum and the Forum) by a short lane which was the original Sacra Via, whose name was then extended to the entire length of the road from the Capitol to the Esquiline Hill. Baddedey conjectures that it originated in a path leading to the sacred Capanne, or primitive temples and the cemetery above the marsh wherein the «prisci Latini,» 'Sabini,» and their forbears interred their kindred. Varro says the Sacra Via, at its eastern end, originated in the Sacellum Streniae whose site is now unknown; eventually it was extended to the Clivus Capitolinus. «From this long track duly developed the rich Republican street lined with temples and houses, descending from the Velia [the north point of the Palatine] so as to skirt the northern flank of the Regia and then lose itself beside the open Forum. . . . Its conditions, like those of the historic buildings on it, kept on improving until the time of Nero; and from having been a simple path to the place of the ancestral dead, it survived to celebrate for centuries the proudest triumphs of the living.» Then Nero appropriated the Velian Ridge and built across it, from the Palatine to the Esquiline, his House of Gold. By this time (A.D. 121) the trade centre of Rome had moved from the imperial fora to the Forum Pacis and the Forum Transitorium, relieving the Sacra Via of the noisy throng going to and from the Colosseum; and the Triumphs — out-door displays of great magnificence — thereafter passed more conveniently through the Forum Pacis and thence into the lower Forum Romanum.

Two other streets — Vicus Jugarius and Vicus Tuscus — were important features of the environs of the great forum. Both originated in the unknown street which lay along the south side of the Forum; the Jugarius at the western end of the Basilica Julia, and running close under the Capitoline to the Porta Carmentalis, near the Theatre of Marcellus. At its entrance into the Forum was the fountain Lacus Servilus where were exposed the heads of senators assassinated during the proscriptions of Sulla. The Vicus Tuscus ran along the eastern end of the Bascilica Julia, through the Velabrum to the Circus Maximus. It was a busy shopping street where almost everything was sold from the finest silks, frankincense and perfumes to fruits, vegetables and fish. Festal pageants moved along it from the Forum to the circus. On one side of the Forum stood the Tabernæ Argentariæ, silversmiths' shops, and in front of S. Adriano, beyond the Tabernæ Novæ, Virginia was stabbed by her father. The front of S. Adriano is a fragment of the Basilica of Æmilius Paulus. This Basilica occupied the site of the famous Curia of Tullus Hostilius. The three gigantic arches are all that remain of the Basilica of Constantine. Little remains of the once superb temple of Venus and Rome, except a cella, countless fragments of columns, and a mass of Corinthian cornice facing the Colosseum. This was the last pagan temple which remained in use in Rome. Near the church of Saint Francesca the Sacra Via passes under the Arch of Titus, the most beautiful monument of its kind remaining in Rome, erected by the senate to commemorate the taking of Jerusalem. Of the orginal erection of 81 A.D. only the central part of the arch remains; the sides were restored as late as 1823. The triumphal procession of Titus occupies two reliefs on the inner sides of the jambs of the arch. The chariot bearing the conqueror is drawn by horses led by the goddess Roma. Victory holds a crown above his head, and Lictors surround him, while the procession passes under the triumphal arch. On the opposite jamb a relief displays the spoils of the Temple of Solomon — the table for the shew-bread, the seven-branched candlestick and the golden trumpets. The apotheosis of Titus — the emperor ascending, borne by an eagle — is represented on the soffit of the arch, while the friezes carry sacrificial scenes. The doings that made the fame of Titus won for him the abhorrence of the Jews, and to this day hatred of him is a part of the creed of that race, which will never forget that captives from Jerusalem marched in chains in the procession of their conquerors, slaved (12,000 of them) in the building of the Colosseum and were forced to lay the stones in the foundation of this very arch, beneath which, it is said, no Jew who respects his religion and racial traditions has ever passed willingly. Vespasian exacted from the Jews the same tribute which they had given to the Temple, and Domitian, who erected the arch, drove them out of Rome, from which they remained exiled until Alexander Severus extended amnesty and permitted them to return to the Ghetto.

The best preserved triumphal arch remaining in the Eternal City is the Constantine, by the Colosseum, which has been accepted as finished in 315, when Roman art was at low tide. The beauty of its lines and the wealth of its decorations have been accounted for by refusing to credit the conception and achievement to that time and claiming that the reliefs and other decorations were taken from an arch erected by Trajan as an entrance to his Forum two centuries before. Recently the fact that it was built by Constantine has been challenged, and the claim set up that it was one of the arches by Domitian rehabilitated after its despoilment by the senate's degree of *Memoriæ damnatio* pronouced against the murdered emperor.

The Romans imitated the Greeks in many things but not in their abandonment of human sacrifice, which was a part of the festivities at the funerals of the great. From simpler arenas these events were transferred to the market places, the first to the Forum Boarium, 264 B.C. For a long time the Forum Romanum was one of the most popular stages for these bloody shows. The Colosseum succeeded it. The Colosseum was the conception and the achievement of the Flavian emperors: Vespasian began it, Titus advanced it and Domitian completed it. Vespasian came from the people; looked to them for popularity and support and built this, the first considerable edifice for the public since the time of Augustus, for the use of the classes. It was in the heart of Rome, a short distance from the Capitol, adjacent to the palaces of the Cæsars. About it surged the high tide of Roman life. It was massive, architecturally purely Latin, of perfect arrangement for popular uses and altogether typically Roman. The three lower stories of the four were built with 80 arches supported by piers, faced with half columns. The fourth was a solid wall faced with pilasters. The first story is Doric, the second Ionic, the third Corinthian and the fourth composite. There was a statue for each of the arches of the second and third floors. The capacity of the building was 50,000 persons; a tier of seats for each external story. Hard by the arena was a marble platform with marble thrones for the Vestals, senators and other dignitaries. Above this platform was the emperor's throne, under a canopy. The emperor entered from the Cælian or the Esquiline, from each of which there was an approach to the throne. There were marble steps above the platform, every second one forming a row of numbered seats, admission to them being by ticket, whose issue was governed by special laws as to the classes eligible to receive them. Above these seats a wall separated them from those still further up. To the topmost seats the women and the lower classes were admitted to see the homicides that made their holiday. The human slaughtering went on throughout the day. Such was pagan Rome a century after the dawn of Christianity. Such indeed it continued, though slowly diminishing in thirst for blood, until Justinian, in the sixth century, put an end to its preying on human victims.

Romulus in his feasts in honor of Neptune — so runs the legend — introduced the most ancient of all Roman spectacles, the circus. Crediting this popular form of amusement to the mythical founder of Rome means that its origin antedates authentic history. No building dedicated to the sport of chariot and other horse races, and called a circus, is known to have existed before the time of the elder Tarquin — about 616 B.C. The Romulan Circus, afterward known as the Circus Maximus, was in the valley between the Palatine and the Aventine, and was the only one in Rome for nearly 400 years. The Flaminian, constructed in 212 B.C., was the second, and the Flora came next, the gift of a noted courtesan. The wealthy and powerful then began to attach circuses to their establishments — Sallust, between the Quirinal and the Pincian, Caligula in the Vatican gardens, Heliogabalus in the Varian gardens, and Alexander Severus in his grounds. It was a subject of satirical comment that Rome possessed nine circuses and only three theatres and three amphitheatres. The most celebrated theatres were those of Pompey, Cornelius Balbus and Marcellus. Pompey's was adorned with beautiful statuary. It held 40,000 persons.

The games in the circus, and indeed all games, the Romans regarded as religious manifestations, and they were accordingly preceded by so-called religious ceremonies. When the Circus Maximus was the scene, the Pompa Circensis commenced at the Capitol and proceeded by the Forum. It was opened by boys afoot and on horseback, followed by charioteers, horsemen and almost naked athletes, and by three classes of dancers — boys, beardless youths and young men, who moved through the Pyrrhic dance to the sound of the lute and the lyre. Others bore altars and burned perfumes upon them, and still others carried images of gods and demigods and sacred vases and utensils. Entering the circus by the central gate of the Carceres, the Porta ad Pompam, the pomp moved around the circus, and, after offering sacrifices at the first goals and at the altar of the Consus, each person who had had a part in the sacrifice took his place in the games.

The Roman theatre was of early origin. The dramatic representations, like the games in the circus and the amphitheatre, were religious. As early as 114 B.C. the Censors Massala and Cassius desired to erect a permanent theatre, but were not permitted to do so for fear that the morals of the people would suffer. The first plays were given *al fresco,* and then in wooden structures without seats, the senate having decreed against seats in order that «the manly habit of standing, combined with mental relaxation, might be the peculiar mark of the Roman people.» A century after Massala and Cassius were refused a permit, a permanent theatre was erected by Pompey. As a peace-offering to the many who still regarded permanent theatres as immoral agencies he erected on the top of his a temple to Venus Vincitrix, «thus,» as Tertullian conceived, «screening a censurable project under the veil of religion.»

The Roman religion was a vast symbolism of things seen and of qualities apprehended. The gods representing conceptions of physical phenomena were characteristically Latin. The oldest document which has come down from Roman antiquity — the *Calendar of the Roman Community* — is filled with the festivals of the gods and goddesses of germination, of seed sowing, harvest, the granary, protection of vines and vats, the shepherds, the fecundation of flocks, etc. The Roman desired the partnership of his gods in his every-day employments, to promote increase of substance by whatever means he resorted to, whether in the keeping of flocks, seafaring or commerce. There were innumerable deities for the field, the forest and the stream, and 12 great gods — Mars, Jupiter, Juno, Vesta, Minerva, Mercury, Ceres, Venus, Neptune, Vulcan, Apollo and Diana. The greatest of these was Mars, the god of killing, the divine hurler of the spear and the protector of Roman life and substance. It was a religion devoid of morality and moral purposes, and rose no higher than the sphere of business and, eventually, under Greek influence, of physical and intellectual pleasure. «As the Romans saw gods everywhere; as all nature — sky, earth and water — was to them full of divinities who watched over human beings with benevolent or jealous eyes, there was no act of life which did not require a prayer or an offering, a sacrifice or a purification, according to the rights prescribed by the ministers of religion. This piety, being the offspring of fear, was all the more attentive in observing signs considered favorable or the reverse; so that everything depended on religion — private life, from the cradle to the tomb; public life from the comitia to the field of battle; even business and pleasure. Games and races were celebrated in honor of the gods; the people's songs were hymns; their dances a prayer; their music uncouth but sacred harmonies; and, as in the Middle Ages, the earliest dramas were pious mysteries. By the continual intervention of the pontiffs, who knew the necessary rites and sacred formulæ, by that of augurs, aruspices and all the interpreters of omens, this religion, devoid of dogmas and of clergy, of ideal and of love, was yet a great force of cohesion for the state and a powerful discipline for the citizen.» (Duruy).

While there was no clergy there were priesthoods, the most ancient bearing relation to Mars. But those who desired anything of the gods made their prayer to them and not to the priests. This was not always a simple matter, and the habit of consulting men of skill — not mere altar menials — resulted in two so-called colleges or corporations: the augurs and the pontifices. The former — six in number — interpreted the language of the gods from the flight of birds; the latter, five engineers, derived their name (pontifices, bridge-builders) from their profession, managed the calendar of the state and saw that every religious and judicial function was performed on the right day.

Temples, unknown in the earliest Roman worship, came to hold a large place in the life of the city, and were probably the first public buildings in time and importance. There were eight types; the ædes, a sacred edifice with prescribed parts; the templum, an open space or edifice consecrated by the augurs; the fanum, a plot of ground consecrated by the pontiff; the dulubrum, an edifice consecrated to several divinities; the tesca, for the deities of a desert place; the ædicula, a little temple apart; the sacellum, a roofed or unroofed cella containing the statue of its divinity, and the lucus, a sacred grove.

Paganism was leaving its wonted temples and fanes and the Christian religion was entering. Rodolfo Lanciani, after 25 years of active exploration of ancient Rome, by excavation and otherwise, declared that every pagan building that was capable of giving shelter to a congregation was transformed, at one time or another, into a church or a chapel, and that patient investigation of the ruins of such edifices always disclosed traces of the work of the Christians, as in the faint delineation of the Saviour and the four saints in the temple of the Sybil at Tivoli and the diminutive figure of Christ on the Cross in one of the flutings of a column in the temple of Neptune. There were discernible remains of religious painting in the apse of the Basilica of Constantine disclosed by the excavations in 1828. The same excellent authority bears testimony to the great number of churches, there seeming to be, at one period, more of them than of habitations. Saint Paul could have said in the Eternal City that the Romans were in all things religious, whether they were of the pagan ages or the succeeding

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The Forum of Pompeii and Vesuvius

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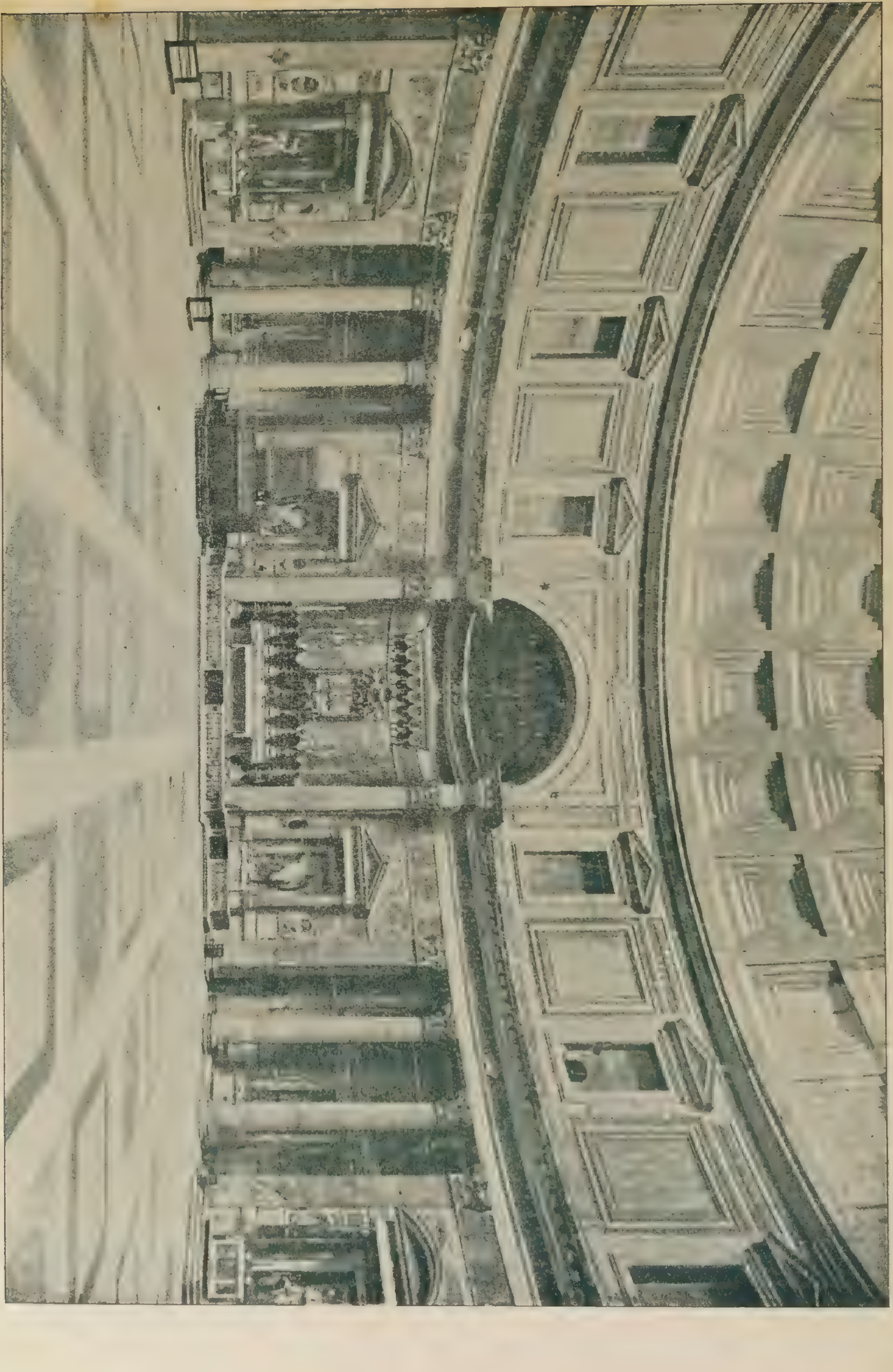
Forum, Capitol and Pavement of Sacred Way

ROME, ITALY



Interior of the Pantheon

Christian era. It requires centuries for the spiritual development that gave Rome its religious supremacy through the powerful agency of the Roman Catholic Church.

Recent excavations have thrown considerable light on the subterranean galleries connected with the games held in the time of Cæsar in the Forum. It is clear that 12 elevators were used to deposit quickly the various parties of combatants. Equestrian statues were later placed above them. The square basement of Janus Medius, wells containing fragments of pottery, graves containing chalices, have also been discovered. Under the substructure, narrow prison cells have come to light. At the foot of the Palatine were revealed the remains of an imperial palace, later transformed into a Christian sepulchre; also some prehistoric tombs. The ancient graffiti — that is the rough sketch or misspelled word scratched upon walls or columns by early Christians and thoughtless idlers — have solved many topographical problems of the ancient monuments of the «Eternal City.»

**History.**— The entire period from the date of the foundation of the city, 753 B.C., to the establishment of the republic, 509 B.C., is in its detailed history unknown to us, and from the mass of myth and legend it is possible to derive the very broadest conceptions only of the beginnings of the Roman state. This is due to the fact that the authentic records of Rome date only from 390 B.C., the year of the destruction of the city by the Gauls. Tradition, then, speaks of seven kings who, including Romulus, ruled over the city for 243 years and assigns to each definite services rendered to the state. Romulus was the founder and conqueror; his successor, Numa Pompilius, was a religious teacher; Servius Tullius, a political reformer and law-giver, etc. The last three kings, Tarquinius Priscus, Servius Tullius and Lucius Tarquinius Superbus, were of Etruscan origin, whereas the earlier rulers had come from Latin stock. With the overthrow of Tarquinius Superbus in 510 the Roman kingship comes to an end. A critical study of this legendary period makes all these names and the events connected with them doubtful, but preserves the general outline of development. Rome, in the modern view, is regarded as having had its origin in the union of three tribes, the so-called Ramnes, Tities and Luceres, of whom the first were of Latin blood, the second of Sabine stock and the third of doubtful affinity. The situation of Rome on the hills near the mouth of the Tiber was favorable for its development, and in the course of time the city extended its authority over the neighboring country until with the destruction of Alba Longa, the ancient religious centre of the Latin peoples, it came to assume a predominant position in Latium. The Etruscan character ascribed to the last three kings points to an Etruscan conquest, and indeed throughout the early period of Rome the influence of the Etruscans to the north is marked, especially in religious customs and in architecture. From the very earliest period the inhabitants of Rome appear to have been divided into two classes, the patricians and the plebeians or *plebs*, with whom probably may be ranked the class of *clients*. It was the patricians alone that constituted the state; the *plebs* had no political rights whatsoever. In fact early Rome should be regarded as consisting of two isolated communities, one comprising the original settlers or, possibly, the conquerors of the city, the other the conquered population and later immigrants, such as those attracted to Rome by the excellent opportunities for trade it offered. Not only was the political power in the hands of the patricians, but even the early Roman religion was largely in the nature of a narrow national creed to which the plebs could not be admitted. Intermarriage between members of the *populus* and plebeians was forbidden. The patricians alone had the right to bear arms. Within the *populus* or state, the headship was vested in the *rex* or king, who combined in himself the functions of war leader, judge and priest, and was assisted by a council of elders or senate. The Roman «people» were divided into wards, class or *gens,* and households. When assembled for the exercise of its sovereign powers it was known as the *comitia curiata.* A change in the relations between patricians and *plebs* was effected by a reform which legend ascribes to Servius Tullius. By this innovation the right of bearing arms was conferred on the *plebs,* and the entire free-holding Roman community was divided into five classes, on the basis of wealth. These classes were subdivided into centuries or «hundreds,» and the entire military assembly of the inhabitants bore the name of *comitia centuriata,* which, instituted undoubtedly for purposes of national defense, soon came to exercise important political powers.

The expulsion of Tarquin was followed by long wars with the Etruscans and the Latin tribes, in the course of which Rome for a time had to contend for its existence. A great victory over the Latins in 496 led to the formation of a Latin Confederacy under the leadership of Rome. Thus strengthened the Romans fought successfully against the Æqui, the Volsci and the Sabines, and in 396 captured the Etruscan stronghold of Veii, which was followed by the subjugation of southern Etrura.

The place of the kings was taken after 509 by two consuls, elected by the *comitia centuriata* from the ranks of the patricians. The institution of the senate was retained and plebeians were admitted to membership, but all magisterial offices were closed to members of that order. The period that follows, therefore, is marked by a bitter struggle on the part of the plebeians for political and, to a degree, social equality. Wealth, too, became concentrated in the hands of the patricians and the distribution of the public lands was carried on entirely in the interests of the ruling class. Discontent was also fostered by the severity of the laws against debtors. In 494 the plebeian army, just returned from a victorious campaign, seceded to the Sacred Mount, near Rome, and threatened to found a city for themselves unless concessions were made. The patricians yielded and the office of tribune of the *plebs* was created for the defense of the interests of the lower order against the ruling class. These tribunes, originally two in number, later increased to 10, were given the right of veto on the decisions of the consuls and the senate. In the course of the struggle for an equitable division of the public land, Spurus Cassius, a patrician who espoused the cause of the *plebs,* fell a victim to the vengeance of his caste (486 B.C.). The demand for a codification of the laws led to the appointment in 451 of 10 decemvirs who after two years' work brought forth the Twelve Tables in which the entire system of public and private law was embodied. The act of violence attempted by Appius Claudius, head of the decemvirs, on the plebeian maiden Virginia led to the overthrow of the decemvirs in 449 B.C. Protected now against the arbitrary misuse of the law on the part of the patricians, the plebeians pursued with renewed strength the struggle for political and social equality. In 445 intermarriage between patricians and plebeians was made legally valid. The consuls were supplanted by military tribunes with consular power who might be chosen from among the plebeians. After this the plebeian conquest of offices proceeded steadily. The quæstorship was gained in 421 B.C., the dictatorship in 356 B.C., the censorship in 351, the prætorship in 337. After a 10 years' struggle it was provided by the so-called Licinian Rogations (367 B.C.) that no citizen should own more than 500 *jugera* of the public domain that the remainder should be distributed among the *plebs* in small allotments. The consulship was also restored and it was made obligatory for one consul to be chosen from the *plebs*. By the year 300 complete equality between the orders had been established. The termination of the contest between the two orders may be assigned to the year 286 B.C., when the Hortensian Law made any decree of the *Comitia Tributa,* wherein the *plebs* were predominant, law for the whole people, the so-called *plebsicite*.

The course of political progress during this period was sharply interrupted by the invasion of the Gauls who in 390 overwhelmed a Roman army on the Allia, burned the city and besieged the garrison in the Capitol. Legend ascribes the defeat of the Gauls to Camillus (q.v.), but in reality it was a large ransom in gold which induced the conquerors to retreat. The devoted patriotism of its citizens, however, restored the fortunes of the city; its houses were rebuilt, the attacks of the neighboring peoples, the Volsci, the Æqui and part of the Latini were repulsed, and within a short time Rome had more than regained its former power. With the establishment of internal peace, its career of rapid conquest begins. The Samnites, the most formidable rivals of the Romans, were defeated in three great wars (343–341, 326–304, 298–290) in the course of which Rome contended successfully against the united forces of the peoples of central Italy, aided in the last of the wars by the Gauls. A rebellion of the Latins was crushed in 338, the long struggle terminated in the complete subjection of the allies, and the inhabitants of Samnium, Picenum, Umbria, Apulia, Lucania and Etruria became the allies of Rome. In 280 war broke out with Tarentum, the most powerful of the Greek cities in southern Italy. Tarentum called Pyrrhus (q.v.), king of Epirus, to its aid. Subjected at first to defeat, the Romans ultimately drove Pyrrhus from Italy and took Tarentum (272). Rome was now mistress of central and southern Italy and had fought with success against the Gauls in the north. To make conquest permanent military colonies were planted in the subjugated territories and a great system of public highways was developed to facilitate communications. The incessant wars had made Rome a nation of soldiers, and now that there was no one to resist it in Italy, it turned its arms against a foreign power, and in the struggle with carthage made the first beginning of its imperial career.

The early relations between Rome and Carthage were friendly and commercial treaties between the two nations had been concluded at various times. The contest between the two broke out in Sicily, of which the Carthaginians were masters in greater part. The first Punic War (264–241 B.C.) began with the invasion of Sicily by a Roman army. The strength of Carthage, however, was on the sea, and to cope with it, the Romans built a fleet with which in 260 they gained a great victory at Mycalæ. The fortunes of the war wavered for a long time until a second victory off the Ægatian Islands in 241 brought Carthage to terms. Sicily was surrendered to the Romans who erected it into their first province, and Carthage pledged itself not to wage war on the allies of Rome. In 238 the Romans seized Sardinia and in the following year extended their sway over the Illyrian coastlands and upper Italy. Cathage, robbed of its island possessions in the Mediterranean, more than made up its losses in Spain, and in 218 B.C. the celebrated Hannibal (q.v.), son of Hamilcar Barca, the conqueror of the peninsula, renewed the contest with Rome (the second Punic War) by his attack on Saguntum, a city ally of Rome. Hannibal invaded Italy (218 B.C.), defeated the Romans at Trebbia on Lake Trasimenus the following year, and in 216 B.C. at Cannæ thoroughly completed the rout of the Romans. Rome, however, remained steadfast with Hannibal at its very gates, husbanded its resources and by carrying the war into Africa forced Hannibal to depart from Italy. In 202 the Carthaginian general was defeated by P. Cornelius Scipio at Zama, and Carthage signed peace giving up Spain to the Romans, dismantling its navy and paying an indemnity of 10,000 talents. The hatred of Rome, however, was not appeased, and when Carthage, after 50 years, showed signs of renewed strength, it was attacked and destroyed (146), after a siege of three years (the third Punic War). The Roman arms in the meantime had also conquered the East. Antiochus III of Syria was defeated in 190 at Sipylus and deprived of his possessions in Asia Minor. Macedonia, after repeated wars, was made a Roman province in 146, and Greece, which had enjoyed the shadow of freedom for 50 years, was reduced to the same condition, in the same year, under the name of Achaia, after Corinth, its most prosperous city, had been stormed and robbed of its art treasures. In 133 Rome fell heir to the dominions of Attalus, king of Pergamus, and the Province of Asia was formed out of the territories thus acquired. The Roman rule in the Spanish peninsula was firmly established after two formidable insurrections, one led by Viriathus (148–140) and the other known as the Numantine War (143–133), had been suppressed.

Republican Rome was now at the height of its power, but the wars which had been crowned with such success abroad brought on evils within the state which were destined to destroy it. The task of governing a world empire and carrying on the great game of diplomacy by which that empire had in large measure been built up, naturally called for a more centralized and rapid exercise of authority than was possible with the cumbrous methods of the popular *comitiæ*. The power of the state gradually passed into the hands of the senate. There grew up at the same time a nobility of the robe, consisting of those who had enriched themselves as rulers of the newly conquered provinces which Rome for a long time regarded as subject territories merely and as fruitful sources of revenue. So wealthy had the state become, indeed, that in the second half of the 2d century B.C. the citizens of Rome were freed from all burdens of taxation, a measure which attracted to Rome a large population of idlers, which derived its chief sustenance from the largesses of the nobles who found it necessary to court the favor of the mob. Throughout Italy the rich Roman office holders established vast landed estates, which were fast coming to be worked by slaves, and the poor farmers, ruined by this formidable competition, came in great numbers to Rome to swell the ranks of the propertyless. Between this great mass of poor proletarians and the small class of officials, senators and landlords, strife was in the nature of things bound to come, and it was this strife between the *Optimates* or the aristocratic party and the *Populares* or proletarians that, skilfully used by ambitious politicians, brought about the fall of the republic. Nobles of the popular champions were the brothers Tiberius and Caius Gracchus (qq.v.) who wrested from the senatorial party an agrarian law favorable to the homeless masses and regained some of the ancient powers of the popular assemblies, but fell victims both to the hatred of their enemies (133 and 121). The war against Jugurtha (q.v.), which revealed the shameless corruption to which the ruling party had sunk, brought forth another popular leader in Marius (q.v.) whose reputation was increased by the splendid victories over the Cimbri and the Teutones in the years 102–101. Moderate at first in his views, Marius was driven, by the agitations of demagogues, to violence. In 90 B.C. the Italians rose in insurrection to enforce their demand for the rights of Roman citizenship, and though the allies were defeated it was deemed expedient to grant them their demands. The termination of this struggle, known as the Social War, in 88 B.C., was followed by a conflict between Marius and Sulla (q.v.), an adherent of the senatorial party, for control in the state, in the course of which both factions were guilty of dreadful excesses. In the year 81 the Marian party was finally overthrown and Sulla, proclaimed dictator, enthroned himself in power by a bloody proscription of his enemies, and proceeded to revolutionize the constitution of the state so as to place the sole power in the hands of the senate and the aristocratic party. But neither senate nor people was thenceforth to govern in Rome. The example of aristocratic rule based on military force had been set by Sulla and the struggle between parties now passed into a struggle between individuals for control. Gnæus Pompeius by his victories over Sertorius in Spain and the suppression of the servile insurrection under Spartacus attained immense popularity and this was increased by his readiness to make concessions to popular demands. After his triumphant campaigns against the Mediterranean pirates and Mithridates (q.v.) he was for a time master of Rome. The senate, however, stirred to an assertion of its rights by its successful course in the conspiracy of Catiline (q.v.) now set itself to oppose his will and Pompey, desirous of redeeming the promises made his veterans of allotments of land in Italy, joined with Gaius Julius Cæsar (q.v.) and Licinius Crassus (q.v.) to form the first Triumvirate which for a time was absolute in Rome (60 B.C.) Cæsar was a leader of the popular party and he aimed at becoming the sole power in the state. Crassus died in 53, and in 49 war broke out between Cæsar and Pompey. The former had under his command a splendid army trained by years of campaigning in Gaul and Britain and in the battle of Pharsalia (48) Cæsar was victorious. Pompey fled to Egypt and there perished and the remnants of his party were wiped out at Thapsus in 46 and Munda in the following year. Cæsar was now undisputed master of the empire, but fell, after a short rule, beneath the daggers of Brutus and his associates, and his death was followed by the renewal of civil war. Gaius Octavius, Cæsar's nephew and adopted son, and Marcus Antonius, Cæsar's lieutenant, both aspired to be his successor, but joined in 43 with Aurelius Lepidus in a second Triumvirate to overthrow the party of Brutus and Cassius. This was accomplished at Philippi in 42, and Octavius and Marcus Antonius, setting aside the weak Lepidus, divided between them the Roman world. But while Octavius governed his western realm with energy, Marcus Antonius gave himself up to the pleasures of Cleopatra's court. War broke out between the two and in the naval battle of Actium (31) the forces of Marcus Antonius were utterly routed. Antonius fell by his own hand and Octavius was left without a rival. With Actium begins the Roman Empire.

Octavius made no change in the established forms of government. In 27 B.C. the senate conferred on him for life the government of all those provinces whose defense called for the employment of the military forces of the empire, together with the supreme command of the army and the title of Augustus. Successively Augustus united in himself the great offices of the state, the consulate, the tribunate, the headship of the sacred colleges. The senate was left with the splendid shadow of power, in reality the mere instrument of the emperor's will. The empire, and especially the provinces, found peace after a half century of civil strife and acquiesced in the rule of an autocrat whose sway was far more kindly than the selfish rule of an aristocratic oligarchy. Under Augustus the economic development of the empire made rapid progress; its parts were brought more closely together by increased means of communication; with peace came also rapid intellectual growth, and Latin literature had its golden age in the reign of Augustus. The boundaries of the empire were extended to the north by the campaigns of the emperor's stepsons Tiberius and Drusus, who carried their victorious arms to the Danube and beyond the Rhine. The last years of Augustus' reign were darkened by domestic unhappiness and the great disaster of the Teutoburg Forest where Varro's legions were annihilated by the Cheruscan chief Arminius. Augustus was succeeded in the principate by his stepson Tiberius (14–37 A.D.) who ruled ably in the beginning but hardened with time into a gloomy despot whose suspicions fell heavily on all those members of the nobility who might in any way become rivals for power. Living in retirement on the island of Capræ he left the government to powerful ministers, of whom Sejanus (q.v.) is the most celebrated. Caius Caligula (37–41), a madman and a tyrant, was murdered by his guards and was followed by Claudius (41–54), a good-natured dotard, who was completely under the control of his infamous wives, Messalina and, after her, Agrippina. By the latter he was poisoned and Agrippina's son, Nero (54–68), succeeded to the throne. After giving the fairest promise for some years, the young emperor, in spite of such advisers as Seneca and Burrus, entered upon a course of infamous excesses and mad escapades which disgusted alike the senate and the army and brought about a revolt before which Nero fled. Unable to escape, he killed himself, the last of the Julian house of emperors.

Galba, Otho and Vitellius, military rulers all proclaimed by their respective armies, fell within the space of two years and were succeeded by Flavius Vespasianus (69–79), commander of the legions in the east. Vespasian introduced economy into the government, brought to an end the Jewish War by the storming of Jerusalem (70) and began the conquest of Britain. The brief reign of his son Titus (79–81) was marked by the eruption of Vesuvius which overwhelmed the cities of Herculaneum and Pompeii (24 Aug. 79). The reign of Domitian (81–96), a younger brother of Titus, was a period of oppression and intellectual stagnation. Cruel, despotic, half-mad Domitian resembled the last rulers of the Julian house rather than the great emperors whom he succeeded and by whom he was followed. Nerva (96–98) was succeeded by M. Ulpius Trajanus (98–117), under whom the empire attained its greatest extent. His campaigns north of the Danube resulted in the erection of the province of Dacia; Armenia and Mespotamia were acquired and the Parthians were driven back from the Euphrates. Hadrian (117–138) had none of the warlike instincts of his predecessor, but he devoted himself to the task of organizing the affairs of the empire, and better to acquaint himself with the condition of the various provinces he made long and repeated journeys embracing every part of the Roman dominions. Hadrian was succeeded by the philosopher-emperors Antonius Pius (138–161) and Marcus Aurelius Antoninus (161–180), in whom were exhibited the highest and fullest development of the pagan character, and though the reign of the latter was disturbed by wars against the Parthians and the peoples of the Danube, it was of this age of the Antonines that an eminent historian speaks as the happiest era in the entire course of European history, if the welfare of the great mass of the population be considered.

With the death of Marcus Aurelius the decline of the empire begins. On the north the Germanic peoples were threatening the Roman frontier and on the east the new Persian kingdom arose as a formidable adversary. Commodus (180–192) neglected the affairs of the empire to win the laurels of a gladiator and was murdered by some of his followers. The Prætorian guard now appears as the maker of emperors. It deposed Pertinax, who had been chosen by the senate and sold the throne at auction to the Senator Didius Julianus. The armies of the provinces arose and three claimants for the throne appeared. The successful candidate Septimius Severus (193–211), successful by force of arms, ruled well and sought to repress the power of the Prætorions. The reign of his son Caracalla (211–217), one of the most vicious tyrants in Roman imperial history, is noteworthy for the extension of the rights of Roman citizenship to all free inhabitants of the empire. Caracalla was assassinated by the Prætorian prefect Macrinus, who was speedily succeeded by Heliogabolus (218–222), a priest of the sun of Emesa. Heliogabalus brought with him to Rome the orgiastic rites of the Orient and became the object of national hatred and contempt. He fell at the hands of the Prætorians, who chose as his successor Alexander Severus (222–235) who ruled with fair ability but perished in a mutiny of the German legions. There followed a period of confusion in which the decline of the empire was rapidly accelerated. Maximinus (235–238), a Thracian by birth and a soldier of fortune, crushed his rivals, the two Gordiani, but fell in battle against the forces of the senate. Balbinus and Maximus, chosen by the senate, were slain by the Prætorians, and Gordianus III ruled from 238 to 244. He was followed by Philip the Arab (244–249), Decius (249–251), Gallus (251–254), Valerianus (254–260) and his colleague Gallienus (254–268). Valerian was defeated by the Persians and taken prisoner and on the ensuing anarchy usurpers arose in every province, known collectively as the Thirty Tyrants. The border lands of the empire suffered from the invasions of the Germanic peoples and the Persians, and a pestilence which raged for 15 years (251–265) carried off one-half of the inhabitants of the empire. The fortunes of Rome rose somewhat under the following emperors: Claudius (268–270), Aurelian (270–275) who drove the Goths beyond the Danube and overthrew the Palmyran kingdom of Zenobia, Tacitus (275–276), and Probus (276–282) who held the Rhine against the Germanic tribes. Carus (282–283) perished in a campaign against the Persians and was succeeded by Numerianus (283–284) who died in the following year. The army thereupon proclaimed as emperor Valerius Diocletianus, who after the death of Carinus (283–285) became sole master of the empire.

Diocletian abandoned the ancient forms of government and transformed the empire into an absolute monarchy. He separated the civil and military administrations, created a new order of officials and brought the finances into order. The supreme power he vested in the hands of two Augusti assisted by two Cæsars who in turn were to succeed to the office of Augustus. Thus a more efficient administration would be ensured by the practical division of the empire into four parts. Diocletian, however, did not count on personal ambitions which were destined to wreck his plan. In 305 Diocletian resigned his office and compelled his fellow Augustus, Maximianus, to do likewise. They were succeeded by the Cæsars, Constantius Chlorus and Galerius, while new Cæsars were created. Confusion and civil war followed and at one time there were six Augusti in the field. The struggle finally narrowed down to a contest between Licinius and Constantine, a son of Constantius, and after two wars Licinius was overthrown and Constantine became sole ruler of the empire. Constantine the Great (324–337) continued the administrative policy of Diocletian. He built Constantinople as a new capital for the empire and made Christianity the state religion. Of his three sons to whom he left power, Constantinus, Constantius and Constans, the first died in 340 and the last in 350. Constantius ruled with undisputed power from 353 to his death in 361. He was followed by Julian, known as the Apostate (361–363), who fell against the Persians and Jovian (363–364). Valentinian I ruled from 364 to 375. He left the government of the East to his brother Valens and made his son Gratian coemperor. Gratian ruled till 383 with Valentinian II as coemperor. The Goths had now broken into the empire and in 378 they inflicted a terrible defeat upon Valens at Adrianople. In this extreme Gratian conferred the government of the east upon Theodosius (379–395), who by war and diplomacy effected a settlement with the Goths. In 392 Valentinian II died and Theodosius became sole ruler of the empire. His own death followed in 395, after he had divided the empire between his sons, Honorius, to whom was assigned the West under the guardianship of Stilicho and Arcadius, who became emperor of the East with Rufinus as his adviser. The influx of Germanic tribes into Italy increased in volume. The tide of invasion was checked for a moment by the generalship of Stilicho (q.v.), but in 410 Rome was sacked by the Goths under Alaric, who, passing into southern Gaul, established a kingdom there. Other Germanic hordes wrested Spain from the Roman arms. Honorius died in 423 and was succeeded after a brief interval by Valentinian III who ruled till 455. The defeat of the Huns under Attila on the Catalaunian Fields in Gaul (451) by Aetius was the last effective assertion of the Roman power. Valentinian III was murdered in 455 and in the strife for the throne that followed, Valentinian's widow summoned to her aid the Vandals from Africa, who plundered the city of its treasures. For 20 years there came a succession of shadow kings, made and unmade by the all powerful commanders of the German mercenaries, Ricimer, and after him Orestes, who in 475 placed his young son Romulus on the throne. The troops under Odoacer (q.v.) revolted, Orestes was overthrown, the child emperor was retired to private life and in 476 Odoacer assumed for himself the title of king of Italy, thus marking the end of the Roman Empire in the West. For the history of the East Roman Empire see Byzantine Empire.

**History of the City of Rome subsequent to 476 A.D.**— After the overthrow of the Western Empire and the defeat and surrender of Odoacer, Rome came under the rule of the Ostrogoths. The city suffered severely in the wars between the Goths and Byzantines, in the course of which it was taken six times. The depredations of the Byzantine emperors as well as of the Christian authorities, who made use of the materials and ornaments of the ancient edifices in the erection of their churches, were the cause of the destruction of many ornaments of the imperial city; but more destructive still were the feuds that afterward (especially in the 10th century and later) raged in Rome between the leading families. In 1084 a part of the Campus Martius and most of the city in the south were devastated by the army of Normans, Greeks and Saracens which Robert Guiscard led to the relief of Gregory VII, then besieged by Henry IV of Germany in the Castle of Sant' Angelo. In the 14th century the work of destruction and depopulation was hastened by the struggles which resulted from the attempt of Rienzi (q.v.) to found a republic, and was continued during the period of confusion that ensued after the commencement of the great schism in 1378. A terrible pestilence which raged in the city in 1348 is said to have reduced the number of inhabitants to less than 20,000. A temporary check was given to the confusion that prevailed in Rome toward the end of the 14th century by Boniface IX, but order was not permanently re-established till Martin V took up his residence in the city after the schism had been virtually terminated by the Council of Constance. Martin's successor, Eugenius IV (1431–47), is usually named as the Pope under whom the work of restoration in Rome began. In this he was followed by Nicholas V (1447–55), who began the building of the Vatican, Pius II (Æneas Sylvius, 1458–64), Paul II (1464–71), who, however, quarried in the Colosseum for the erection of the Palazzo di Venezia, as did also Paul III (1534–50), when building the Palazzo Farnese. But the most important period in the architectural history of Modern Rome was the end of the 15th and beginning of the 16th centuries, when the labors of Bramante, the two Sangalli, Peruzzi and Michelangelo were pursued under the patronage of Sixtus IV, Alexander VI, Julius II and Leo X, and when the works of the great architects were adorned in the interior by artists as great or greater, such as Raphael and Michelangelo himself. In 1527 the city was sacked by an imperial army under the Constable of Bourbon. From this date onward the city began to extend more and more over all parts of the Campus Martius. Much was done in the 16th century, especially by Paul III, Pius IV, Gregory XIII and Sixtus V, for the embellishment and enlargement of the town, the improvement of the streets and the restoration of the fortifications. Many remains of antiquity were then rescued from destruction, although many more were sacrificed, particularly under Sixtus, for the sake of modern structures. In the 18th century Benedict XIV, Clement XIV (founder of the Museo Pio-Clementino) and Pius VI deserve special mention for their efforts to preserve and beautify Rome. In 1798 Rome was occupied by the French and deprived of many of its art treasures. At the same time a republic was erected in Rome, but this only lasted for a short time, and after a series of disturbances and changes the Pope was again reinstated in his dominions in 1799. (See Italy). From 1809 to 1814 Rome was once more under French rule, the States of the Church having in the former year been annexed to the Napoleonic Empire. The short-lived Roman republic of 1848–49 was followed by the restoration of the papal rule in 1850. On 20 Sept. 1870 the Italian troops, after effecting a breach in the Porta Pia, in the northeast of the city, marched in along the Via di Porta Pia (henceforth called Via Venti Settembre). Since then Rome has been in the possession of Italy, and since the 1st of July of the following year the capital of the kingdom.

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**ROME,** N. Y., city in Oneida County, on the Mohawk River and at the junction of the Barge, Erie and Black River canals, and on the New York Central and New York, Ontario and Western railroads. The city is about 110 miles west by north of Albany and 15 miles northwest of Utica. It is at the head of the Mohawk Valley, on a plateau about 450 feet above sea-level. The first settlement was made in 1760 by John Roof. The central part of the city is the site of Fort Stanwix, erected here in 1758 at a cost of over $200,000. It was then a place of great importance as it was the defensive point in the «carrying place,» or portage, that part of the route between the Atlantic and the Great Lakes, where the journey had to be made by land. Fort Stanwix was a storm centre in the French War and also in the Revolutionary War. At Rome the Stars and Stripes were first unfurled in battle; for here in July and August, 1777, there were many sharp engagements, and finally the Tryon County Militia under Herkimer defeated the British under St. Leger in the battle at Oriskany. A government arsenal was established here in 1814, but in 1873 was sold for a factory. In 1819 Rome became a village and in 1870 was chartered as a city.

The greater part of the water supply is taken from Fish Creek, about 13 miles from the city. The surrounding country is devoted to farming and dairying; but Rome is a manufacturing city. The chief industrial establishments are brass and copper mills, locomotive works, knitting mills, brick yards, canneries, metal bedstead factories, wire works, automobile and radiator factories, and creameries. The facilities for transportation give Rome considerable commercial advantages. The prominent public buildings are the Rome State Custodial Asylum for incurable insane, the Oneida County Home, the municipal buildings and some of the business blocks. There are several churches and missions. The educational institutions are the Central New York Institution for Deaf-Mutes, Academy of the Holy Names (Roman Catholic), opened in 1865, several graded public and parish schools, public kindergartens, private schools and libraries. The libraries are the high school, the Jervis Public and the Y. M. C. A. There are national banks with a combined capital of over $200,000 and savings banks. The city debt is $915,614.55, largely due to the amounts paid for city sewerage, waterworks and new schools. The assessed valuation is about $10,955,875 yearly. The government is vested in a mayor and a council of 15 members, who hold office three years. Pop. 23,868.

**ROME, Œcumenical Councils of,** are six in number, namely, five Lateran Councils, so called as having been held in the Lateran Palace, and the Vatican Council, held in the palace of the Vatican. 1. The ninth general Council of the Church, the first Lateran Council, was held in the reign of Calixtus II in 1123; it confirmed the concordat of Worms regarding Investiture (q.v.). 2. The second Lateran (10th general) Council, held in 1139 under Innocent II, condemned the Manichæan errors of Arnold of Brescia (q.v.). 3. The third Lateran (11th general) Council, under Alexander III in 1179, condemned the heresies and impieties of the Waldenses and Albigenses. 4. The 12th general Council (4th Lateran) held in 1215 in the pontificate of Innocent III, confirmed the doctrine of transubstantiation and promulgated decrees for the reformation of abuses in the Church and the extirpation of heresies. 5. The 19th general Council (5th Lateran) under Julius II, assembled in 1511, was in session till 1517 when Leo X was Pope; it enacted some laws for the reformation of clerical discipline and procured from the king of France, Francis I, the revocation of the Pragmatic Sanction (q.v.) which the French clergy had ever regarded as the bulwark of the Gallican Liberties. 6. The Council of the Vatican (20th œcumenical council), which was opened 8 Dec. 1869 and closed 20 Oct. 1870, under Pius IX, affirmed as the teaching of the Catholic Church the doctrine that the Pope when teaching *ex cathedra* and defining matters of faith or morals is always divinely aided and is infallible.

**ROME STATE CUSTODIAL ASYLUM,** an institution for the custody, maintenance and treatment of the custodial class of feeble-minded, located at Rome, N. Y. It was formerly the Oneida County Insane Asylum and Almshouse, but by the acts of the legislature in 1893 and 1894, the building and grounds were purchased by the State. Among other things, calisthenics, dancing, drilling, kindergarten, sloyd and articulation are taught. Agricultural colonies for the brighter male inmates have also been established. Feeble-minded are committed to this asylum from all counties in the State, according to the quota assigned each county, which is based on the population of the respective counties, as compared with the capacity of the institution. For their care there are over 20 large buildings, beside several small sheds, etc. The average number of inmates is about 750.

**ROMEO AND JULIET.** This, the first tragedy that Shakespeare wrote, was first printed in 1597 as «a garbled and imperfect rendering, made up partly from copies of portions of the original, partly from recollection and from notes taken during the performance.» The second quarto, a revised edition, «newly corrected, augmented and amended,» was published in 1599, a third quarto in 1609, and a fourth version in the first folio (1623). Although there is no evidence that the play was acted before 1596, it is probable that it was written as early as 1594, although later revised. The immaturity of the play is indicated in the large number of conceits, puns and other forms of quibbling, such as we have in ‹Love's Labors Lost› and ‹Mid-Summer Night's Dream›; in the preponderance of rhymed verse and in the decidedly lyrical character of many of the passages. On the other hand the excellence of the plot, the supreme beauty of the best scenes, the assured mastery of blank verse displayed in parts, indicate an excellence not found in the earlier plays and suggest, therefore, careful revision of an earlier version. The story had long been a popular one in Italy and France when it was translated in a long narrative poem entitled ‹The Tragical History of Romeo and Juliet› by Arthur Brooke (1562) and in a shorter prose version by William Painter in his ‹Palace of Pleasure› (1567).

There is no better evidence that Shakespeare conceived his task in handling sources as one of adapting and not originating plots than a detailed comparison of Brooke's poem and the play. Not only are the chief characters and practically all the minor ones found in the poem, but entire scenes and many bits of psychological insight attributed to Shakespeare. The change of time from four or five months to as many days, the dramatic contrasts of characters and scenes and the heightened poetical language — all indicate Shakespeare's power of dramatization. What stirred the interest of Shakespeare in reading the old story was the dramatic situation presented by the lovers in conflict with their environment. Tragedy has not become with him, as in his later plays, so much the inner conflict between the complex elements of a hero's soul. Romeo and Juliet are a pair of «star-crossed lovers» who move somewhat inevitably toward their fate. Theirs is a love that knows no impediment; they bear it out even to the edge of doom. It is the great and typical love tragedy of English literature. The love that unites Romeo and Juliet springs from no worldly consideration; it is natural, spontaneous, all-absorbing. There is no moral error involved in their tragedy — at the best a tragic error. One of the best effects of the play is found in the contrast between these highly emotional lovers and Paris and Lady Capulet, to whom love is a mere conventional relationship; the Nurse, to whom it is a matter of pleasurable instinct and even vulgar comment; Friar Laurence, with his somewhat worldly counsels against the excess of it; and Mercutio, transfixing it with the shafts of his reckless and cynical wit. In the blending of comedy and tragedy, which is more marked in this tragedy than in any of his others except perhaps ‹Hamlet,› Shakespeare was following the demand of life in its more complex aspects rather than the laws of classic art. While the defects of the play already suggested tend to mar the complete unity, the final impression is that of the great scenes: The Balcony Scene with the beauty of the Italian sky at night and the softest music of lovers' tongues; the Dawn Scene, when the earth is a-quiver between night and day and the lovers breathe out in each other's arms the saddest of farewells; and the Grave Scene, where the old Friar unites above the graves of the lovers the two families from whose loins they sprang. Then we know that we are reading the greatest of love poems, if not the greatest of Shakespeare's tragedies.

EDWIN MIMS.

**RÖMER**, rė'mĕr, **Ole**, Danish astronomer: b. Aarhus, 25 Sept. 1644; d. Copenhagen, 19 Sept. 1710. After study at the University of Copenhagen he was in 1671–81 at Paris, where he made observations in the royal observatory and was elected to the Academy. In 1681 he was made professor of mathematics and director of the observatory at Copenhagen, and subsequently became a councilor of state. He is known chiefly as the discoverer of the velocity of light, which he determined by observation of the eclipses of the satellites of Jupiter. He found that when Jupiter and the earth were on opposite sides of the sun, the eclipse seemed to occur too late; when on the same side, too early. The extreme deviation from mean time he computed at 11 minutes; it is now known to be approximately 8 minutes 20 seconds, that is, light crosses the space between the earth and the sun (a little less than 93,000,000 miles) in about 8 minutes. (See LIGHT). Römer invented the transit instrument (1689) and meridian circle (transit and vertical circle combined; 1690). Consult Grant, ‹History of Physical Astronomy› (1852); Horrebow, Peter, ‹Adversaria› (1910).

**ROMERO**, rō-mā'rō, DON **Matias**, Mexican diplomat: b. Oaxaca, Mexico, 24 Feb. 1837; d. Washington, D. C., 30 Feb. 1898. He was graduated at the Academy of Theoretical and Practical Law, Mexico City, in 1855, and admitted to the bar in 1857. In the revolution of that year he supported the government and served as secretary to Melchor Ocampo. In 1859 he was appointed secretary to the Mexican legation at Washington and in 1860–63 was *chargé d'affaires*. He then returned to Mexico where he was commissioned colonel in the army, became chief of staff to General Diaz and later in the same year resumed his diplomatic career as Minister to the United States. He held the portfolio of the treasurer in Juarez's cabinet in 1868–73, was a member of the Senate in 1876 and on the election of Diaz to the Presidency he resumed his position in the treasury. He was Postmaster-General in 1879–80 and in 1882 he was again sent as Minister to the United States, where he arranged the boundary question and concluded a reciprocity treaty. He was reappointed in 1884 and continued in the position until his death. He published more than 50 volumes, chiefly of technical reports, among which are ‹Coffee-culture on the Southern Coast of Chiapas› (1875); ‹Correspondence of the Mexican Legation at Washington during the French Intervention› (1870–85); ‹The State of Oaxaca›; ‹Mexico and the United States.›

**ROMEYN**, rō'mīn, **John Brodhead**, American Presbyterian clergyman: b. Marbletown, N. Y., 8 Nov. 1777; d. New York, 22 Feb. 1825. He was graduated at Columbia in 1795 and was licensed to preach in 1798. He held charges at Rhinebeck, Schenectady, Albany and New York successively, attained a high reputation as a theologian and was popular as a preacher. He was one of the founders of Princeton Theological Seminary, president of Transylvania University, a trustee of Princeton College and a moderator in the Presbyterian General Assembly. His sermons were collected and published in 1816.

**ROMILLY**, rŏm'ĭ-lĭ, SIR **Samuel**, English statesman and jurist: b. 1 March 1757; d. London, 2 Nov. 1818. He entered Gray's Inn to study for the bar, to which he was called in 1783, and gradually rose to distinction in the Court of Chancery, in which he ultimately took the lead. During the short administration of Fox and Lord Grenville (1806) he was appointed solicitor-general (being member for Queensborough), and knighted. When the Whigs went out of office he remained in Parliament, where he pleaded the necessity of a revision of the criminal code, with a view to the limitation of capital punishment, and a more appropriate regulation of the scale of penalties. To his exertions may be traced the final determination of the executive to the reform and condensation of the various acts in regard to crime, effected under the superintendence of Sir Robert Peel. After a lifetime spent in securing mitigation of the criminal laws, he died by his own hand. Consult ‹Memoirs,› written by himself (1840); also ‹The Creevy Papers› (1904).

**ROMNEY,** rŏm'nĭ, **George,** English painter: b. Beckside, near Dalton-in-Furness, Lancashire, 15 Dec. 1734; d. Kendal, 15 Nov. 1802. His father was a cabinet-maker, and the boy learned this trade, but he also taught himself drawing and wood-carving and at 19 was apprenticed to a portrait painter at Kendal named Steele. In 1757 he entered a career as portrait painter, and after local success went to London (1762), leaving his wife (whom he married in 1756) and his two children in Kendal. The following year he won a prize offered by the Society of Art for a historical painting, by his ‹Death of General Wolfe,› and rose steadily in popularity until he held a position beside Reynolds and Gainsborough as a portrait painter. He visited France twice; once in 1764 and again in 1790, and resided in Italy during the years 1773–75. While in Italy he gave much attention to the works of Correggio, and this, along with his study of the nude, greatly influenced his after-work. In 1783 Romney made the acquaintance of Emma Hart, who afterward married Sir William Hamilton, and she became the model from which he painted such well-known pictures as ‹Saint Cecilia,› ‹Joan of Arc,› ‹A Magdalen,› ‹A Bacchante› and ‹Sensibility.› His ‹Lady Hamilton as Circe› sold in 1890 for $20,210; his ‹Lady Hamilton as Sensibility› in the same year for $15,025. In the Metropolitan Museum in New York are his ‹Lady Hamilton as Daphne,› ‹Mrs. Fitzherbert› and ‹Mrs. Scot-Jacksen.› Gradually he began to withdraw from portrait painting and gave more time to historical and imaginative work. In 1786 Alderman Boydell founded his famous Shakespeare gallery, to which Romney contributed a scene from the ‹Tempest› and the ‹Infant Shakespeare attended by the Passions›; while about this time he painted ‹Milton and his Daughters› and ‹Newton making Experiments with the Prism.› In order to find room for these great imaginative pictures he erected a large studio at Hampstead, which he occupied in 1797. But his health at this time began to fail, and in the summer of 1799 he returned to Kendal utterly weakened in body and mind. He had only seen his wife twice since he left her 35 years before, yet she received and nursed him faithfully through his premature senility and dotage until his death.

The art of Romney displays a certain fitfulness of achievement due partly to the instability of his character, and partly to his defective early training. His defects of technique are most apparent in his historical and imaginative subjects; it is only when we examine his portraits, and especially his female portraits, that we find that beauty of form and subtle charm of color which place him among the greatest portrait painters of the 18th century. Consult Hagley, ‹Life of George Romney› (1809); Gamlin, ‹George Romney and His Art›; Gower, ‹Romney and Sir Thomas Laurence›; J. Romney, ‹Memoirs of the Life and Writings of George Romney› (1830).

**ROMNEY,** W. Va., city and county-seat of Hampshire County, situated in the valley of the South Branch of the Potomac River and on the Baltimore and Ohio Railroad, about 100 miles west of Washington, D. C. The city's industries include a barrel factory, planing mill and a flouring mill. There are two banks — one State and one National. The value of the city's taxable property is $899,342. The annual receipts average about $5,850. The chief public buildings are the county courthouse, Literary Hall, the State institution for the deaf and blind and the high school. There is also a school for negroes. The city is well laid out with wide streets running at right angles, good water-supply system, electric lights and sewage system. It is the shipping centre for a fruit-growing section. The form of government is that of the ordinary municipal corporation chartered by the State. Pop. (1920) 1,028.

**ROMNEY** (W. Va.), **Engagements at.** This place was important as an outpost of the Union troops guarding the Baltimore and Ohio Railroad and also as a base for operations up the valley of the south branch of the Potomac. It was held early in June 1861 by Col. Angus McDonald, with about 500 Virginia troops and two guns. On the night of 12 June Col. Lew Wallace, with 800 men of the 11th Indiana regiment, went by rail from Cumberland to New Creek Station and marching across the mountains attacked and routed McDonald on the 13th, and on the same day started on his return by the route he had come. Information of Wallace's movement reached Gen. J. E. Johnston, commanding the Confederate forces at Harper's Ferry, on the morning of the 14th, and supposing it to be the advance of General McClellan's column from West Virginia to coöperate with General Patterson, who was threatening to cross the Potomac at Williamsport, Johnston ordered Col. A. P. Hill, with three regiments, to march on Romney and check the movement (see NEW CREEK). He burned all the bridges on the Potomac from Harper's Ferry to Williamsport, abandoned Harper's Ferry, and fell back to Winchester. On 23 September Lieutenant-Colonel Cantwell, with detachments of the 4th and 8th Ohio, a company of cavalry and one gun, marched from New Creek, drove McDonald's forces from Romney on the 24th and with a loss of three killed and 30 wounded, returned to New Creek, closely followed by McDonald's cavalry. On 25 October Gen. B. F. Kelley, with detachments of Ohio and West Virginia troops and two companies of cavalry, in all about 2,500 men and two guns, started from New Creek for the permanent occupation of Romney. He captured it on the 26th, after a sharp engagement with McDonald's forces, driving them beyond the town on the Winchester road, and capturing all their trains, two guns, 300 stands of arms and much camp equipage. A supporting column of the 2d Maryland, Colonel Johns, marching from the mouth of Patterson's Creek, through Frankfort and Springfield, was met by the 114th Virginia militia, under Col. A. Monroe, at the bridge over the South Branch, seven miles from Romney, checked, and fell back to Patterson's Creek, with a loss of six or eight in killed and wounded. On 28

October Gen. «Stonewall» Jackson was assigned to the command of the Valley District, with headquarters at Winchester, and immediately prepared to clear the valley of Union troops. He called out the militia, and being reinforced by General Loring's division from West Virginia, set out late in December to destroy the Chesapeake and Ohio Canal and the Baltimore and Ohio Railroad, and to recover Romney. To withdraw his attention from the railroad, Colonel Dunning, in command at Romney, made a demonstration toward Winchester with 2,000 infantry and cavalry and six guns. He marched on the night of 6 Jan. 1862, and next morning at Blue's Gap, 16 miles from Romney, fell upon 700 Virginia militia, under Colonel Monroe, scattered them and captured two guns, several prisoners and some baggage, without the loss of a man, and returned to Romney. On the same day Jackson left the vicinity of Hancock and marched for Romney. Hearing of his approach, the Union troops retreated from Romney on the 10th toward New Creek. Jackson occupied the town on the 14th and placed Loring's division there in winter quarters. Loring and his officers complained to the Richmond authorities, and the Confederate Secretary of War ordered Jackson to move the division back to Winchester, which was done 31 January, and on 7 February the town was again occupied by Union troops under Gen. F. W. Lander. Between this time and the close of the war the town changed hands several times, but, for the greater part of the time was in Union possession. Consult ‹Official Records› (Vols. II and V).

**ROMOLA,** George Eliot's sole experiment in historical fiction, was originally published as a serial in *The Cornhill Magazine* from July 1862 to August 1863. Hitherto George Eliot had taken the substance of her novels from memories of English life in the midland counties where she had grown up and passed her youth. Into her new field she was led primarily by an interest in Savonarola, the great Florentine preacher and reformer of the Renaissance. Twice she visited Florence, where she made exhaustive studies in the politics of the period in order that her details might have the exactness of an historian. Her novel opens with the death of Lorenzo, the Magnificent, in 1492, and closes with the execution of Savonarola in 1498. The portrait of Savonarola, with which she took great pains, has been subjected to much criticism. As she paints the prophet and preacher, he has a sort of dual personality. In her words: «The passionate sensibility which, impatient of definite thought, floods every idea with emotion and tends toward contemplative ecstasy, alternated in him with a keen perception of outward facts and a vigorous practical judgment of men and things.» So without his being quite aware of it, Savonarola comes perilously near duplicity in his dealings with the people. He invokes the «trial by fire,» but hesitates and fears when the day of the ordeal arrives; he watches the clouds, and delays until the rains come to quench the fires prepared for him; then he can say that the hand of God is visible in the heavens to protect him. Still, in the end George Eliot says: «Power rose against him not because of his sins, but because of his greatness — not because he sought to deceive the world, but because he sought to make it noble.»

On this historical background is projected the story of Tito Melema, a young Greek, beautiful and clever, who in a few short years betrays all who put their trust in him — Romola, Tessa, Savonarola and Badassarre his foster-father, at whose hands he finally meets his fate. By many Tito is regarded as George Eliot's finest character study; but with this opinion I do not agree. No one can deny the relentless logic with which George Eliot pursues the downward career of this pleasure-loving young man; but the study would be more impressive were not Tito so weak when the reader first meets him. We can understand his ingratitude toward Baldassarre and that Tessa should be deceived by him; but we cannot understand the ease with which he imposes upon Romola and Savonarola. The plot, too, develops into a loose revenge-tragedy of the Elizabethan type, wherein Baldassarre, an impossible character outside of fiction, appears and disappears whenever the occasion demands his presence or his absence. Great as is the novel, it will not stand comparison with those novels in which George Eliot depicts the life she knew. Romola is really a new and weaker version of Maggie Tulliver in ‹The Mill on the Floss,› without the flesh and blood of the Margaret in Charles Reade's ‹Cloister and the Hearth,› who was Romola's contemporary; and for George Eliot's most powerful study in the deterioration of character, we must turn from Tito Melema to Dr. Lydgate in ‹Middlemarch,› who began his career with noble ideals and afterwards lost them.

Wilbur L. Cross.

**ROMULUS,** rŏm'ū-lŭs, mythical founder and first king of Rome. He is said to have been the son of Sylvia, generally, but incorrectly called Rhea Silvia, daughter of Numitor, king of Alba, and one of the priestesses of Vesta. By the god Mars she became the mother of male twins, whom Amulius, who had usurped the throne of Numitor, ordered to be thrown into the Anio, but the basket containing the two boys, Romulus and Remus, was stranded at the foot of the Palatine Hill. Here a she-wolf, going down to the river to drink, was attracted by their cries, carried them to her cave, and suckled them. Some time afterward chance brought thither Faustulus, the king's herdsman, who took them home and educated them. With him Romulus and Remus spent their youth. When they had grown up Amulius was deprived of his usurped throne by Romulus who reinstated his grandfather Numitor in his dominions. After this the brothers resolved to build a city. Romulus wished to place it on the Palatine, Remus on the Aventine, or on another hill three or four miles down the Tiber. Determining to reach a decision by consulting the augurs, each took his station on his favorite hill; the night passed away, and at the first streak of dawn Remus saw six vultures; but at sunrise, when this news was brought to Romulus, 12 vultures flew by him. Each claimed the augury in his favor; but as their companions decided for Romulus his brother was forced to yield. Romulus, to outline the boundary of the city, yoked a bullock and a heifer to a plow, marked a deep furrow around tne base of the Palatine, and guided by this line began to raise the wall. Remus leaped over the rude rampart in scorn, whereupon the enraged Romulus slew him. According to another tradition Remus fled from the anger of his brother beyond the Alps, and founded Rheims. Romulus was immediately struck with remorse, and could obtain no rest till he appeased his brother's shade by instituting the festival of the Lemuria for the souls of the departed. Thus is Rome said to have been founded in the year 753 (or according to others 752 or 751) B.C. The small number of friends who had followed Romulus were insufficient to people his city. Men enough were gained by making the city a refuge for exiles; but the Roman citizens soon wanted women. Romulus thereupon instituted a religious festival, to which he invited the Sabines with their wives and daughters. In the midst of the festival the unarmed strangers were suddenly attacked, and the Sabine women borne away as captives. The two states thus became engaged in war; but the entreaties of the ravished females, who threw themselves between the contending parties, at length effected a peace, and Rome gained by her union with the Sabines an important addition. According to tradition Romulus ascended to heaven into the company of the gods, after he had completed the work of founding the eternal city; and, until the introduction of Christianity, Rome worshipped its founder in temples expressly dedicated to him.

**RONALDSHAY,** rŭn'ald-shā, **North and South,** two of the Orkney Islands (q.v.), Scotland.

**RONAYNE,** rō-nān', **Maurice,** American Roman Catholic clergyman and author: b. Castlemartyr, Ireland, 3 April 1828; d. Fordham, N. Y., 3 March 1903. He received his education for the priesthood in Ireland and France, and entered the Jesuit Order in 1853. He came to the United States in 1855, was ordained to the priesthood in 1856, taught in Saint John's College, Fordham, N. Y., and was for many years professor of history in the college of Saint Francis Xavier, New York. In 1898 he returned to the college at Fordham, where he spent the remaining years of his life as spiritual director. His writings upon the labor question may be found in various Roman Catholic periodicals. His most important books are ‹Religion and Science› (1879), and ‹God Knowable and Known.›

**RONCADOR,** one of several Californian drum-fishes of the family *Sciænidæ,* especially the red *Sciæna saturna,* and *Roncador stearnsi,* both food-fishes of some importance.

**RONCESVALLES,** rōn-thĕs-väl'yĕs (Fr. RONCEVAUX, rôṅs-vō), Spain a valley in Navarre, between Pamplona and Saint Jean de Port, where, according to tradition, the rear of Charlemagne's army was defeated by the Arabs in 778, and the brave Roland killed. The battle forms an essential part in the fabulous cyclus of Charles the Great or Charlemagne. (See ROLAND and ROMANCE). Roncesvalles, the chief place of the valley, 25 miles northeast of Pamplona, is traversed by the so-called Gates of Roland, leading over the Pyrenees to France; in the church fabulous antiquities bearing the name of Roland are shown. The French under Moncey defeated the Spaniards here in 1794, and here Soult took up a strong position in 1813, from which he was dislodged by Wellington.

**RONCO,** a West Indian name for various drumfish of the genus *Hæmulon,* popular among fishermen and in the market, especially *H. bonariense* (ronco prieto) and *H. parra* (ronco blanco) or salior's choice.

**RONDEAU,** rŏn'dō, or **RONDO,** originally a short lyric of 13 lines divided into three unequal strophes; the two or three first words form the burden, and are repeated after the 8th and 13th line. The term is now chiefly applied to a musical composition, vocal or instrumental, generally consisting of three strains, the first of which closes in the original key, while each of the others is so constructed in point of modulation as to reconduct the ear in an easy and natural manner to the first strain. The rondeau takes its name from the circumstance of the melody going round after both the second and third strain to the first strain, with which it is finally closed. While it frequently forms the last movement of a sonata or a symphony, it is quite as common as a separate composition.

**RONGE, Johannes,** yō-hän'nĕs rŏng'ė, German Anti-Catholic religious leader: b. Bischofswalde, Silesia, 16 Oct. 1813; d. Vienna, 26 Oct. 1887. He studied theology at the University of Breslau 1837–39, was ordained to the priesthood in 1840, and in 1841 became chaplain at Grottkau. Having manifested an opposition to the discipline of the Church, he was suspended in 1843. On 1 Oct. 1844 he published a letter against the exhibition of the «holy coat» at Treves, which was soon followed by the organization of the so-called German Catholic congregations. (See GERMAN CATHOLICS). He published in succession a number of pamphlets, in which he called on the Roman Catholic laity and the lower clergy to leave the communion of that Church. These were generally understood to be written from the standpoint of deism; and in subsequent years Ronge pronounced himself more and more unreservedly in favor of deistic doctrines. He took part with the radicals in 1848 and was obliged to flee to London, where he signed in 1851, with Ruge, Struve, Kinkel, and others, a democratic manifesto to the German people, and where he became the leader of a free congregation. In consequence of the amnesty granted by the Prussian government, he in 1861 again made his appearance in Breslau. He founded a reform association at Frankfort-on-the-Main in 1863, and from 1873 resided at Darmstadt. Consult the article ‹Deutschkatholiken› in Wetzer und Welte's ‹Kirchenlexikon.›

**RONSARD, Pierre de,** pē-ār dė rôṅ-sär, French poet: b. Chateau de la Poissonnière, Vendômois, 11 Sept. 1524; d. Saint Cosme near Tours, 27 Dec. 1585. He entered as page the service of the dauphin, and then of the Duc d'Orléans, second son of the king. In 1538 he accompanied James V of Scotland and his bride Marie de Lorraine back to their kingdom and remained at the Scottish court three years. He also spent six months at the English court and was then employed in a diplomatic capacity in

Germany, Piedmont, Flanders and Scotland. On his return to France he devoted himself with great eagerness to the study of literature. With a group of followers, self-styled the «Pleiade,» he cast away the literary traditions and ideals of mediæval France and sought inspiration from the Latin and Greek classics. The result was transformatory, and Ronsard's influence on the progress of French letters was thus very great. In the Floral Games at Toulouse he triumphed over his competitors and received a silver statue of Minerva which he presented to Henry II. He was greatly esteemed by that prince and by his successors, Francis II and Charles IX; obtained the abbey of Bellozane and was also prior of Saint Cosme. His writings, consisting of sonnets, madrigals, eclogues, lyric pieces, elegies and satires and a fragment of an epic poem, 'La Franciade,' were read with almost incredible admiration by his contemporaries and brought him valuable presents from Queen Elizabeth of England and the imprisoned Queen of Scots. Many of his sonnets and odes possess considerable merit, but his style is marred by affectation and his pages are filled with freshly imported words from the classic languages. There are editions by Blanchemain (1856–67) and Marty-Laveaux (1887). Consult Perdrizet, P., 'Ronsard et la Réforme' (1902).

**RÖNTGEN RAYS.** See Roentgen, Wilhelm Konrad; X-Ray.

**ROOD, Ogden Nicholas,** American physicist: b. Danbury, Conn., 3 Feb. 1831; d. New York, 12 Nov. 1902. He was graduated at Princeton in 1852 and afterward studied at Yale and at the universities of Munich and Berlin. He was appointed to the chair of physics and chemistry at the University of Troy in 1858, and in 1863 accepted the chair of physics at Columbia where he remained until his death. In his researches and experimental work he showed great originality and skill, his specialties being in the fields of mechanics, optics, acoustics and electricity. His original experiments included the application of stereoscopic photography to the microscope, the quantitative analysis in color contrast, and the measurement of the duration of flashes of lightning. He was the first to describe a photometric method that is independent of color. He was a leading member of the prominent scientific societies, author of nearly 100 monographs and also wrote 'Modern Chromatics' (1881); 'The Voice and the Ear,' etc. Consult files of the *American Journal of Science.*

**ROOD,** a cross. The term is more particularly applied to the large cross erected in Roman Catholic churches over the entrance of the chapel or choir; this is often of a very large size, says the 'Glossary of Architecture,' and when complete is like other crucifixes, accompained by the figures of Saint John and the Blessed Virgin, placed one on each side of the foot of the cross, but these are more often omitted. The rood-loft was the gallery in which the cross was set to view, and the rood-arch was the arch between the nave and the chancel, that is, the arch over the rood-loft. Rood-lofts became common in England in the 14th century, were ordered taken down by the government in the 15th and 16th centuries and temporarily were restored under Queen Mary. Consult 'Irish Constitution of 1635,' p. 110.

**ROOD.** See Weights and Measures.

**ROOD-SCREEN,** a screen of wood, stone, or wrought iron, separating the western end of the ritual choir from the nave in many churches and forming a support for the rood, a cross or crucifix, placed in the centre of the rood-beam. Sometimes the rood-screen was double, with vaulting between and a rood-loft over it, as at Southwell Cathedral. It was frequently ornamented with niches in which were placed statues as at York Minster and Rochester Cathedral.

**ROOF,** the covering of a building by which the interior secures protection. In ordinary acceptation the term includes the covering and the supporting framework, though in carpentry the term is applied only to the framework. Roofs are broadly distinguished as flat or sloping. The former were used almost exclusively among ancient peoples and are at present employed largely in Eastern countries where the roof is devoted to some extent to domestic purposes. The sloping roof, being to a great extent an ornamental consideration, has given way to the flat roof in modern business buildings, where economy of construction prevails. Flat roofs are usually covered with tar, metal, asphalt or gravel. The framework of the roof has been, until the modern application of iron to this use, almost exclusively of timber; and the end desired has been to arrange the timbers in such relations as to secure the greatest strength and stiffness consistent with the minimum of weight; also to avoid lateral strain or thrust upon the walls. The form chosen has been that of two or more inclined planes for the slopes of the roof over the enclosed space. Two inclined planes are formed by a series of sloping rafters having the lower ends tied together to prevent spreading, the upper ends forming the angle of the roof and connected by the ridge-piece. The method of tying the rafters is by a horizontal beam laid across the span, receiving at each end the foot of one of the rafters, the two being securely mortised. This is called a tie-beam. When the roof is of wide span it becomes necessary to secure the tie-beam against settling in the middle, and this is done by joining the centre of the tie-beam and the ridge angle of the rafters by a king-post (A in Fig. 1).

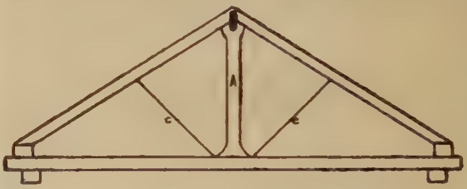

Fig. 1.

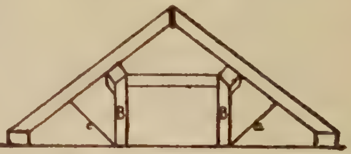

Fig. 2.

Sometimes two vertical beams are suspended from the rafters to the tie-beam, and these are called queen-posts (BB in Fig. 2).

Braces or struts (c) may be carried from the foot of the suspended posts to the rafters to afford additional stiffness to the frame. Further support is given to the rafters in roofs of long span by one or a series of transverse longitudinal beams called purlins. Early Christian basilicas, of which San Miniato in Florence is typical, had roofs of the character just described. When the period of Gothic architecture was reached the king-post and tie-beam were carved and molded, in cases where wooden roofs were used instead of stone vaulting. Open timber roofs were used in England more than on the Continent for churches and halls. The finest example is that of Westminster Hall (Fig. 3) completed in 1399 and having a span of 68 feet.

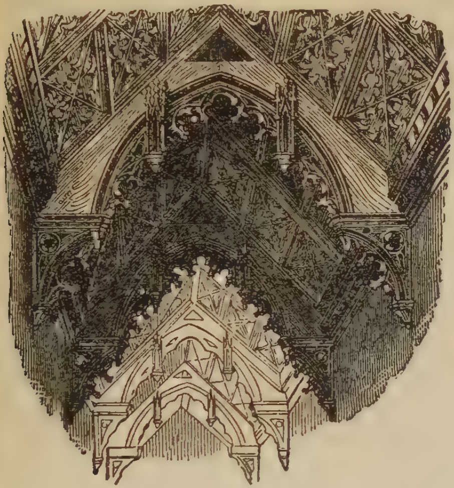

Fig. 3.

In this example the central part of the tie-beam is cut away, and the great rigidity of the framework prevents any inordinate thrust upon the walls.

The inclination or pitch of the roof seems to be regulated by taste, after the general law is observed that countries of moist climate require a sloping roof to carry off the rain and snow. The slope of a Greek pediment, marking that of the roof, varied from 15 to 16½ degrees; Roman roofs, the roofs of Romanesque buildings, and also those of the Renaissance era, generally carried an inclination increased one-quarter to that of Greek buildings. The Gothic pitch sometimes reached to 50 or 60 degrees; but since the period of the prevalence of one particular style, great latitude has been observed,— Germany and the Netherlands favoring a steep roof, and France retaining a moderately steep inclination even in her Renaissance structures; but England has tended toward the lowering of the pitch.

The commonest form is the gable roof where each end terminates in a gable. Modifications of this are the curb-roof in which the slope is broken, further distinguished as the gambrel roof where only two opposite sides are sloping; the French roof where the slope beneath the curb approaches almost to verticality and that above is nearly flat or with a slightly visible slope; the Mansard roof, named after its designer, Mansard, where the slope beneath the curb is pierced by dormer windows. The hipped roof is one having a double pitch and no gables, and the ridge shorter than the parallel wall plates. The pyramidal roof is one where the ridge is so short as to approach a point. Various modifications of these general forms are known by a variety of names.

The recent use of iron for roof-frames has become very general, especially where wide spans are required as in the case of railway train sheds. The general principles of construction employed in wooden frames are utilized in iron ridge roofs; but for oval or conical roofs, the iron trusses require a consideration of the principles governing those of bridge trusses. See Bridges.

The covering of sloping roofs is of various material, such as thin slabs of stone, thatch, tiles, slate, metal, shingles and cement. Metal shingles and asbestos shingles are increasing in use. Of the 120 factories in the United States making roofing materials, one-fourth make metal shingles and ceilings. There are employed in these factories over 4,000 people and the gross annual product is valued at about $28,000,000. There is also a production of over $5,000,000 worth in factories mainly devoted to other industries.

**ROOFING TILES.** See Tiles.

**ROOK, Edward Francis,** American artist: b. New York, 1870. He studied under Jean Paul Laurens and Benjamin Constant in Paris. He received the Temple gold medal at the Philadelphia Academy of Fine Arts in 1898; and was awarded medals at the Buffalo, Saint Louis, Buenos Aires and Panama Expositions. Among his works are ‹Deserted Street, Moonlight› (Pennsylvania Academy, Philadelphia), and ‹Pearl Clouds, Moonlight› (Cincinnati Art Museum).

**ROOK,** a European crow (*Corvus frugilegus*), having the base of the bill, forehead and upper part of the throat naked. The rook possesses a voice much less harsh than that of the crow. Rooks are gregarious in habits, and nest in great communities or rookeries, thus differing from other species of the family. The nests, which are placed in tree tops, are built or repaired early in March, and the young are hatched in April. The food consists chiefly of grubs, although grain appears to form part of the dietary. In Great Britain the rook is a permanent resident or partial migrant, but in other parts of Europe these birds appear to be more or less strictly migratory. The same species is found in Asia, where related species having the facial feathers only partially deciduous also occur.

**ROOKE,** rŭk, Sir **George,** English admiral: b. 1650; d. 24 Jan. 1709. At an early age he entered the royal navy, and in 1689 commanded a squadron at the siege of Londonderry, was knighted for his burning of six French ships at Barfleur in 1692 and in 1694 became one of the lords commissioners of the Admiralty and admiral. He distinguished himself in the fight against the French and Spanish fleets in Vigo Bay (1702), and at the capture of Gibraltar in July 1704. On 9 Aug. 1704 he fell in with a French fleet of much superior force, under the Comte de Toulouse, off Malaga, and an engagement which lasted nearly the whole day ensued. Victory remained with the English, though none of the French ships were captured. The news of the Malaga victory reached England during the celebration over Blenheim, and Rooke's name was put forward for honors along with Marlborough's; but being a Tory he suffered from the jealousies of the Whigs, the dominant power. His command was taken away from him and he retired in disgust to his family seat in Kent.

**ROOKWOOD POTTERY.** See POTTERY.

**ROON,** rōn, **Albrecht Theodor Emil von,** Prussian soldier: b. Pleushagen, 30 April 1803; d. Berlin, 23 Feb. 1879. He entered the army in 1821; was attached to the Topographical Bureau in Berlin, 1833–35; became captain in 1836, and major in 1842; in 1848 became chief of staff of the 8th Army corps at Coblentz, took part in the campaign at Baden of that year; and was promoted lieutenant-general in 1859. In the latter year he was appointed a member of a commission on the reorganization of the army. He had given special attention to this subject for many years, but his proposals which were in effect an extension with modifications of Scharnhorst's system, embracing a universal three years' service and a reserve, were carried only after long opposition. The Austrian War of 1866 demonstrated that value of his system. He attended the German emperor throughout the Franco-Prussian War, and was created a count in 1871. The Ministry of War which he had held since 1859 he resigned in 1871 together with the Ministry of Marine, held since 1861. In 1872 he succeeded Bismarck as president of the Prussian Cabinet and was made field-marshal shortly after; but soon resigned. He was author of several works on geography published between 1832 and 1839.

**ROOS, Johann Heinrich,** German painter: b. Otterberg, in the Palatinate, 27 Oct. 1631; d. Frankfort-on-Main, 3 Oct. 1685. He went to Amsterdam and applied himself to landscape and animal painting. After a visit to Italy he settled finally at Frankfort. Most of his works are animal landscapes, executed in the conventional Italian style.

**ROOSEVELT,** rō'zĕ-vĕlt, **Nicholas J.,** American inventor: b. New York, 27 Dec. 1767; d. Skaneateles, N. Y., 30 July 1854. He engaged in manufacturing and inventing in New York and was connected with Robert R. Livingston and John Stevens in experimental boatbuilding. In 1798 he conceived the idea of a vertical wheel, a suggestion which made steam navigation a success. The first experiment was made in a boat launched in 1802 and propelled by the vertical wheels. In 1809 he was associated with Fulton in the introduction of steamboats into Western waters and in 1811 built and launched the *New Orleans*, with which he made a pioneer trip down the Ohio and Mississippi rivers in 14 days. He obtained letters patent from the United States government in 1814 protecting his invention, but was denied protection by the New Jersey legislature. Fulton never claimed the invention as his own, and Roosevelt's title to it has never been legally proved.

**ROOSEVELT, Robert Barnwell,** American author and politician: b. New York, 7 Aug. 1829; d. Sayville, L. I., 14 June 1906. He was admitted to the bar and practised law in New York until 1871, when he was elected to Congress. In 1888 he was appointed Minister to the Netherlands and served two years. He was active in opposing the Tweed ring, and wrote several works of natural history. His most important public service, however, was in the establishment of the United States Fish Commission, of which measure he was the originator and promoter while in Congress.

**ROOSEVELT, Theodore,** American author, naturalist, explorer, statesman and soldier, and 26th President of the United States: b. New York City, 27 Oct. 1858; d. Sagamore Hill, N. Y., 6 Jan. 1919. He was born at No. 28 East 20th street, New York City. His father (of the same name) was a prominent merchant and a man noted for patriotism, public spirit and enlightened interest in many movements for social betterment. His mother's maiden name was Martha Bullock; she was a native of Georgia and had two brothers who served in the Confederate navy during the Civil War. The Roosevelt family is descended from Klaes Martensen Roosevelt, who came from Holland to what was then «New Amsterdam» in 1644; for seven generations thereafter all of Theodore's paternal ancestors bearing the family name were born on the island of Manhattan, and were well known there as leading citizens. Young Theodore was a sickly child, greatly troubled with asthma and extremely nearsighted; the condition of his health somewhat retarded his education, but he developed, when he was still very young, a passion for serious reading and an intelligent interest in natural history. In 1876 he entered Harvard College and received his degree of bachelor of arts in 1880. Before going to college and while there, as well as afterward, he gave much time to athletic exercises of various kinds and, although seriously handicapped by physical deficiencies, became, by sheer force of will and indomitable perseverance, a good boxer, a good rider and a good marksman, while, by frequently living in the open air and persistence in strenuous exercise, he not only threw off the maladies of his childhood, but became a tireless walker and rider and developed a magnificent physique, able to respond for many years to the exhausting calls he made upon it. While in college he began a History of the Naval War of 1812, which he completed after graduation; this is a work of much greater literary merit than he himself afterward ascribed* to its opening chapters, but the most interesting and significant incident connected with its preparation is the generally admitted fact that he undertook it because he found all the American narratives of that conflict, then current, untrustworthy, prejudiced and unfair to the public enemy; then, as ever throughout his life, his love of truth and fair play was, perhaps, his most striking characteristic; hypocrisy, humbug and obtaining praise through false pretenses were always, for him, the very abomination of desolation.

At the age of 23 he was elected to the New York assembly. Through family tradition and personal conviction he was a Republican, and

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* "Those chapters were so dry they would have made a dictionary seem light reading in comparison." 'Autobiography,' p. 27.

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THEODORE ROOSEVELT
The Twenty-sixth President of the United States

his district was normally Republican also; but, two years before, the local bossling, to please the supreme party boss, had caused the nomination and election of a candidate whose record at Albany of unscrupulous subserviency to the boss in question had so disgusted decent people among his constituents as to make the choice of a Democrat reasonably certain, were he renominated by the Republicans. Nevertheless, the boss insisted on his tool's renomination, and the bossling proceeded to obey orders; young Roosevelt reluctantly consented to be a candidate in the primaries, at the urgent entreaty of a local politician named Joe Murray, who pointed out to him how his party was about to suffer defeat merely to promote the discreditable personal ends of its unscrupulous leaders; and, to the great astonishment of these leaders, the supposed stripling was nominated, despite their hostility, and easily elected. In the assembly his independence, courage, devotion to duty, outspoken enmity to corruption in every form and enlightened and fearless efforts to promote practical reforms and truly progressive legislation, in the face of bitter hostility on the part of wealthy «interests» and politicians owned by them, soon made him a figure of national prominence. The sudden deaths of his mother and his first wife within a few hours of each other in February 1884, and the discouraging political outlook after the nomination by the Republicans of James G. Blaine for the Presidency, a nomination which Roosevelt, as a delegate to the National Convention, had sought vainly to prevent, caused his temporary retirement from public life and led him to become for some two years a ranchman in the wild country then given over to cowboys and their herds.

Two years later he returned to New York to accept the Republican nomination for mayor, tendered him principally because the more wealthy and conservative element of his party was alarmed by the candidacy of Henry George, representing an ephemeral «United Labor» organization; Roosevelt was defeated on this occasion, mainly by reason of defections among the same class of his supporters who deemed Abram S. Hewitt, the Tammany nominee, a «safer» mayor for their purposes. In February 1889 he attended a National Conference of Civil Service Reformers in Baltimore and there expressed such outspoken and unqualified devotion to the principles of the merit system that President Harrison appointed him a member of the Civil Service Commission. In this post he made the Civil Service Law a living force for good government and pure politics and himself a source of real terror to politicians who had previously believed, with good reason, and acted on the belief that this statute and the commission it created could be safely ignored and defied by officials having «pull.» He remained in office for more than three years after President Cleveland had succeeded President Harrison, resigning to become one of the police commissioners of New York City, appointed by Mayor Strong after the Reform victory of 1894. Here again he showed himself the fearless and inflexible enemy of the many abuses which had become chronic in the New York police, and thereby incurred the rancorous hostility of all those who profited, in one way or another, by these abuses, including many citizens outwardly reputable and ready to favor reforms so long as these led only to talk, but shocked by Roosevelt's thoroughgoing and practical discharge of his sworn duty. After two years of what he called a «grimy struggle» he was given a new field of useful activity by his appointment as Assistant Secretary of the Navy.

For Roosevelt it was a labor of love to promote the efficiency of the American navy, and to his energy, eminent talents for administration and fervent patriotism the brilliant success of our fleets in the war with Spain must be fairly ascribed in very large measure. He took part in the war, however, in another capacity; as soon as its outbreak became certain he tendered his services as a soldier, was offered the command of a regiment of volunteer cavalry, declined this in view of the superior experience of his old friend, afterward Maj. Gen. Leonard Wood, then a surgeon with a notable record as an Indian-fighter, but accepted a commission as lieutenant-colonel in the same organization, soon to be known as the famous Rough Riders, and served with distinction at the engagement of Las Guasimas and the battle of San Juan Hill. He became colonel of the regiment when Colonel Wood was promoted, was nominated brevet brigadier-general «for gallantry in battle» and was warmly commended by Generals Wheeler, Young, Sumner and Wood and several other officers of rank who were eye-witnesses of his conduct. When his regiment was disbanded he became at once the Republican candidate for governor of New York.

He owed his nomination to the extremity of the bosses and bosslings then in control of the party, who at that time hated Roosevelt, but hated yet more their own exclusion from power and its profits, and recognized that he was the only man they could then put up with any hope of victory. The result justified both their forecast and their antipathy, for Roosevelt was elected by a good majority and also proved himself as unsatisfactory a governor, for their purposes, as he had been an assemblyman 17 years before. Especially did he render himself obnoxious to wealthy corporations and to the prominent politicians (both Republicans and Democrats) employed by such corporations by insisting on their paying reasonable taxes on their franchises. As the only means to prevent his obtaining a second term as governor, the leading Republican politicians tried to force and finally succeeded in forcing upon him the nomination for the Vice-Presidency at the National Convention of 1900 in Philadelphia.

It had been the hope of these politicians that, when thus «kicked upstairs,» he would be reduced to ornamental impotency; but these calculations were falsified by the murder of President McKinley, and, on 14 Sept. 1901, Theodore Roosevelt took the oath of office as President at the house of Mr. Ansley Wilcox in Buffalo. On 8 Nov. 1904 he was elected to the same office against Judge Alton B. Parker, the Democratic candidate, by 330 electoral votes to 136 and a popular majority of some two millions and a half.

To relate, even in the barest outline, the events of Roosevelt's Presidency would be quite impossible within the limits of this article. His virtually enforced adjustment of the great coal strike, his long struggle, in Congress and the courts, with «trusts» and combinations in restraint of trade and actual or threatened monopolies, his successful mediation between Russia and Japan, his restoration of order in Cuba, his vindication of the Monroe Doctrine in the case of Venezuela, his rescue of the Isthmus from Colombia and construction of the Panama Canal, his steadfast and untiring efforts to preserve the public lands from misappropriation and trespass on the part of land thieves, to develop the country's natural resources for the benefit of the people and to detect, root out and punish corruption and breach of trust in all branches of the public service — each of these subjects could be fairly and adequately treated only if it had an article to itself as long as the present. The history of his Presidency was, in short, the history of the United States during seven and a half years of great moment. On the evening of election day 1904 he said publicly that he would not accept a nomination for another term. To this determination he adhered inflexibly in 1908, resisting a tremendous pressure from almost every part of the country, based upon the universal conviction that his nomination and election were absolutely certain if his consent could be obtained, and a large measure of doubt as to whether he could transfer to any other candidate enough of his own immense popularity to assure the latter's choice. He succeeded, however, in bringing about the nomination and election, as his successor, of William Howard Taft, whom he had selected, after very serious consideration and some hesitancy, as on the whole the most suitable among the public men connected with his administration to continue the practical application of his theories and principles in the conduct of the government. A few weeks after Mr. Taft's inauguration Roosevelt started on a hunting trip to East Africa.

On his return he found the Republican party threatened with defeat and the administration gravely discredited by Mr. Taft's complete failure to justify the hopes of those who had secured his nomination and most signally of all, of Roosevelt himself; he found also a general conviction, which every day strengthened, that only his own acceptance of the Republican nomination for the Presidency in 1912 could prevent a Democratic victory, Against both his own inclination and his own judgment he finally yielded to the overwhelming pressure brought upon him, and consented, in his own words, to «cast his hat into the ring.» The party primaries gave him an undoubted majority in the convention held at Chicago in June 1912, but the wealthy «interests» which controlled the National Committee, and, through it, the preliminary organization of the convention, and the unscrupulous politicians who did their bidding deliberately preferred defeat at the polls to four years more of Roosevelt, and unseated enough of his delegates to ensure the formal renomination of Mr. Taft. An improvised «Progressive» party, created largely as a protest against the injustice and dishonesty of this nomination, put Roosevelt in the field, and a bitter, three-cornered contest followed; during this a partially demented man, maddened by the violent abuse of Roosevelt's enemies, attempted to kill him at Milwaukee, inflicting a wound which obliged him to remain two weeks in a hospital. At the election Mr. Taft met probably the most humiliating defeat ever experienced by a candidate for the Presidency, carrying only two small States and receiving only eight electoral votes; Roosevelt obtained 80, and a popular vote of over 4,000,000, but the division of the Republicans made inevitable the election of the Democratic candidate, Woodrow Wilson.

In October 1913, Roosevelt sailed for South America to explore a virtually unknown portion of the Brazilian wilderness. This expedition was attended by great dangers and hardships; his party was for months entirely cut off from civilization and suffered terribly from the tropical fevers always lurking in those regions. He was himself so very ill and the whole party so utterly exhausted that he urged them to leave him to die; but his companions, including his son Kermit, refused to do this, and finally succeeded in reaching a frontier settlement. Roosevelt returned to his home in May 1914, and thereafter was outwardly as earnest, as active and as interested in public affairs as he had ever been; but the poison of the South American fever remained in his system, undermined his strength and undoubtedly shortened his life.

Roosevelt's return to the United States was very soon followed by the outbreak of the European War. He had entirely disapproved of President Wilson's policy of «watchful waiting» and inconclusive intermeddling in Mexican affairs, and now found himself yet more radically out of sympathy with the latter's advocacy of «neutrality in thought» respecting Belgium and the settlement underlying his «too proud to fight» speech: moreover Roosevelt had naturally and strongly felt as an unseemly reflection on his own official course that a successor in the Presidency should negotiate a treaty with Colombia apologizing for the action of the United States at Panama. He became more and more critical of the administration as he realized more and more clearly the imminent danger to the United States involved in a possible German victory, and the unwillingness of President Wilson and of the political party then dominant to adopt any adequate measures of preparation for war, or even to resent with dignity and spirit repeated and insolent outrages on our citizens. To bring about Mr. Wilson's defeat in 1916, he refused to run as the Progressive candidate for the Presidency (thereby virtually destroying the short-lived Progressive party), when the same interests and, in the main, the same men responsible for Mr. Taft's candidacy four years before again showed that they preferred their party's defeat to Roosevelt's election, by giving the Republican nomination to Justice Charles E. Hughes. Roosevelt earnestly and whole-heartedly supported Hughes in the ensuing campaign, but his innumerable friends were less forgiving than himself, and their profound dissatisfaction, joined to some clumsy and arrogant blunders on the part of the Republican managers, gave Woodrow Wilson four years more in the White House.

The President's final break with Germany was to Roosevelt a very agreeable surprise. He threw himself with all possible ardor into the advocacy of an energetic participation in the war on our part, and offered to raise a division of volunteers, in which he should himself serve as one of the brigadier-generals. He was instantly overwhelmed with applications to serve in the force from all parts of the Union; it is said that more than 250,000 men asked to join it. Congress authorized its organization, notwithstanding strenuous opposition from the President; but the latter refused to avail himself of the authority thus conferred; Roosevelt could not be allowed to return home with a military record.

Roosevelt was bitterly disappointed by this refusal; prevented by the President from serving his country in the field, he did everything in his power to arouse an imperative demand by public opinion for a prosecution of the war with unflinching vigor up to a decisive victory, without regard to the cost and sacrifices involved, and protested with all possible energy against any thought of negotiation or parley with the public enemy; for, with many others, he entertained something more than a suspicion that peace without victory was the secret aim of President Wilson. All four of his sons promptly entered the army and served with distinction; one of the four was killed; two were wounded. When on 25 Oct. 1918, the President appealed to the voters of the Nation to elect a Democratic Congress, as a mark of confidence in himself and approval of his policy, Roosevelt vigorously denounced the President's course, and united with ex-President Taft in urging that the voters should choose «a Congress which will not register the will of one man, but, fresh from the people, will enact the will of the people.» The extremely significant result of the election, which, instead of giving the President the vote of confidence he had asked, changed Democratic majorities of 10 in the Senate and five in the House into Republican majorities of 2 in the Senate and 45 in the House was the last of Roosevelt's many political triumphs; and it proved a solace to the last two months of his life. His health, fatally weakened by the results of his South American explorations, had gradually failed during the four busy and exciting years succeeding his return. About midnight on 5 Jan. 1919, he dictated from his sickbed a communication to the chairman of the Republican National Committee; some four hours afterward, he died quietly in his sleep.

Roosevelt's political and public services were but a part of his many activities. He was a very prolific writer; beside innumerable addresses, magazine articles and occasional publications he wrote ‹The Winning of the West› a history of the pioneer settlement of our states beyond the Alleghanies; Lives of Thomas Hart Benson, Gouverneur Morris and Oliver Cromwell; a ‹History of New York›; an ‹Autobiography›; ‹African Game Trails›; ‹Through the Brazilian Wilderness›; and a multitude of other books, some setting forth his theories or narrating his experiences as a naturalist and hunter, some expounding his views on moral, social or economic problems, many devoted to the political issues of the times or defending his opinions (always very pronounced and definite) as to disputed questions of ethics or public policy. He was likewise an indefatigable traveler, and always ready to give the brief holidays allowed him by his literary labors and his public duties to journeys in wild regions and life in the open. He was twice married, in 1880, to Alice Lee, and, in 1886, to Edith Kermit Carow. By his first marriage, he left one daughter, Alice, the wife of Nicholas Longworth of Ohio; by his second, he left three sons, Theodore, Kermit and Archibald, and one daughter, Ethel, the wife of Dr. Richard Derby of New York; his youngest son, Quentin, had been killed in the war.

Theodore Roosevelt was a man of extraordinary powers and, to those who knew him well and understood him, a man of most attractive character and qualities. Doubtless he was sometimes gravely misunderstood; his mental processes were so abnormally rapid that he often seemed to act with little or no reflection, when he had, in fact, considered the question at issue most thoroughly and conscientiously, although, perhaps, in one-tenth of the time which would have been needed for the purpose by an ordinary man. Moreover the strength of his convictions and the vivacity of his speech and manner confused and frightened timid men or those who knew him but slightly, and led them to think of and describe him as arbitrary and overbearing; he was, in truth, somewhat exceptionally anxious for information, assistance and advice from those for whom he felt respect and in whom he had confidence; but only one who wasn't afraid of him could fairly judge or really like him. He had the stern sense of duty, the lofty purpose and the strict morals of puritanism, without any of its prudishness or pharisaism or intolerance, and, most emphatically, without any of its too common hypocrisy or affectation of virtue. He detested falsehood in every form and shams of every kind, and, throughout his long and stormy career as a public servant and a political leader, always fought fairly and in the open, and was restrained by the instincts of a gentleman and the scruples of a man of honor. It were needless to speak of his patriotism or his courage,— the events of his life sufficiently attest these,— but it is the firm belief of the writer that his profound wisdom, the unselfishness of his devotion to duty and his immense usefulness to his country will be more clearly recognized and more highly esteemed by each successive generation of Americans in our national future.

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**ROOSEVELT AND THE PROGRESSIVE PARTY.** The Progressive movement in the Republican party, like its counterpart in the Democratic party, laid emphasis on the need of freeing government, both State and Federal, from the domination of special interests and the prostitution of government to serve the needs of a small moneyed minority. The fight more especially developed into a struggle against corporations. This struggle has had three principal phases: first, the attempt to control and regulate corporate activities; second, to resist the efforts made by vested corporate interests to exploit the natural resources of the country in their own interest and, third, the revolt against the tariff revision of 1909 which was made in the interests of the same predatory classes. The Sherman Law was the effort made to accomplish the first end; it was not very successful and had a disastrous effect on business. When Roosevelt became President in 1901 he regarded this law as of doubtful efficacy. His chief objection to it was that it failed to discriminate between good corporations and bad corporations, assuming that all combinations were trusts and, therefore, dangerous and to be suppressed. Roosevelt in 1903 prevailed on Congress to establish a Bureau of Corporations in the Department of Commerce and Labor, through which «power and authority,» were granted, «to make . . . diligent investigation into the organization, conduct and management of the business of any corporation, joint-stock company or corporate combination engaged in commerce among the several states and with foreign nations.»

Roosevelt, however, before the bureau made its reports of the activities of «big business» determined to try out the Sherman Law in the cases of the Standard Oil Company and the American Tobacco Company. While nominally successful the punishment of the delinquent corporations was more apparent than real. The financial panic of 1907 further stayed the President's hand but it was clearly his intention and desire that Taft, his successor, should carry on the work of government control of corporations.

The conservation movement to protect the natural resources of the nation in the interest of all the people and from exploitation by private individuals and interests was the second great objective of the progressive forces during Mr. Roosevelt's incumbency of the White House. The President in March 1907 appointed the Interstate Waterways Commission to investigate conservation as far as the waterways of the country were concerned. A preliminary investigation by the commission caused it to recommend to the President the calling of a conference to discuss conservation from all angles. The result was the memorable conference at the White House on 13 May 1908 and the subsequent appointment of Gifford Pinchot as head of the National Conservation Commission. In the fight to conserve the natural resources of the country Mr. Roosevelt received no aid from the majority of the Congress. Everything possible was done to hamper him and the special private interests were sufficiently powerful to prevent him in his effort to put the conservation movement on a secure basis. The lasting benefit of his struggle was the awakening of public interest in the question which in later years put the movement beyond the power of the special interests and their subservient tools among the politicians.

In endorsing Taft as his successor, Mr. Roosevelt firmly believed that his favorite measures, «his policies,» would be carried out faithfully. Roosevelt's disappointment was keen, therefore, when the Payne-Aldrich tariff raised certain schedules upward instead of downward as had been promised by Taft and his political sponsors during the pre-election campaign. Taft's support of Ballinger, his advocacy of a sham reciprocity treaty with Canada and his yielding to the old conservative standpatters and reactionaries made it impossible for the progressive members of his party to support him for re-election in 1912. The tariff discussion of 1909 was the most potent factor in widening the breach between the Progressives and the reactionaries among the Republicans and helped define the progressive movement for the country. An open break with the Taft administration followed and the National Progressive Republican League was formed by the Progressive senators and members of the House of Representatives, pledged to these specific reforms: (1) election of United States senators by popular vote; (2) direct primaries; (3) direct election of delegates to national conventions; (4) initiative, referendum and recall clauses in all State constitutions; and (5) a corrupt practices law with adequate provision for its enforcement. The league grew rapidly and was sufficiently powerful to cause progress and reform legislation to be passed in the last year of the Taft administration. Its growth proved that the Republican party as then constituted had no room for real progressives and either a new party must be created or the old effectively regenerated.

Already in April 1911 the Progressive wing of the Republicans made preparation to ensure the nomination of one of their members in 1912. For a time it appeared that Senator La Follette would be the Progressive leader against reaction in the Republican National Convention of 1912. Certain interests, however, were able to cause his candidacy to be dropped and his followers at once transferred their allegiance to Roosevelt. The latter was less uncompromising than La Follette, having yielded to the special interests whenever he could make an advance by so doing. Good government had no more doughty champion than he and popular rights no advocate more sincere. The contest for the Republican nomination by the spring of 1912 dwindled to a struggle between the followers of Taft and Roosevelt. The contest was one of the most bitter in our political history because of the former close relations existing between the two candidates. The issues, however, were sharply defined. Taft stood forth the champion of privilege while Roosevelt as throughout his career espoused the cause of democracy, or government by the people.

The crisis came at the Chicago Convention of the Republican party, 18–22 June 1912. The delegates to that convention were of three classes according to mode of selection: Those elected by State conventions, those chosen directly by the people and those chosen directly under pledge to vote for designated candidates. The reactionaries under Taft controlled the first or «machine» group; the two other groups were largely controlled by Roosevelt. It was soon observed that the contest would be close and the fight was soon centred on those delegates whose seats were contested, neither candidate having a clear majority of uncontested seats. The reactionary National Committee, appointed four years before, now proceeded to award the contested seats and adjusted matters so that Taft was ensured a majority. The Progressives claimed that these decisions were made in bad faith, that the nomination was stolen, and they withdrew from the convention. They held a rump convention to discuss future plans. Roosevelt told the delegates to return to their homes, sound the popular sentiment and return to Chicago on 5 August, when if the popular demand should be sufficiently strong, a third party would be established. On 5 August the Progressive delegates met again in Chicago and reported an overwhelming popular demand for a new party opposed to boss rule and machine politics. On 6 August Mr. Roosevelt in what he called his «Confession of Faith» outlined the purposes of the new party, stating that: «the old parties are husks, with no real soul within either, divided on artificial lines, boss-ridden and privilege-controlled, each a jumble of incongruous elements, and neither daring to speak out wisely and fearlessly what should be said on the vital issues of the day.» The new Progressive movement he characterized as «a movement of truth, sincerity and wisdom, a movement which proposes to put at the service of all our people the collective power of the people, through their governmental agencies, alike in the Nation and in the several States. . . . We propose to raise aloft a standard to which all honest men can repair, and under which all can fight, no matter what their political differences, if they are content to face the future and no longer to dwell among the dead issues of the past.» Roosevelt was nominated for the Presidency and Hiram Johnson of California for Vice-President. The platform of the new party promised the five reforms outlined above as the demands of the National Progressive League and also outlined a program of social and industrial justice, to correct or mitigate the injurious effects incident to our modern industry. Within the three months following the convention the Progressive party organized itself from the national committee down to the local election district and at the November election polled more than 4,000,000 votes — a feat unparalleled in all political history. When the Presidential campaign of 1916 arrived and Mr. Hughes became the Republican candidate, old animosities were laid aside and Mr. Roosevelt and nearly all of his Progressive followers supported the old party, believing rightly that a division would again make for a Democratic victory and four more years of Wilson and Democratic administration. Tactless blunders by a few campaign managers nullified Mr. Roosevelt's efforts and Wilson secured a second term. In October 1919 an intimate friend of Mr. Roosevelt disclosed the fact that the latter was preparing to secure the nomination for the Presidency in 1920, when he prophesied that the standpatters would have to take him and «with a larger dose» of reform than in 1904. His untimely death removed America's most progressive and most earnest leader; perhaps, the only man who was able to place a strong government in Washington instead of a cabal of theorists and impractical idealists. Consult La Follette, R. M., 'Autobiography' (1918); Roosevelt, Theodore, 'Thou Shalt Not Steal' (in the *Outlook* of 12 July 1913); id. 'Progressive Principles,' edited by Elmer H. Youngman (New York 1913); De Witt, B. P., 'The Progressive Movement' (ib. 1915); Walling, W. E., 'Progressivism — and After' (ib. 1914); New York *Times* of 17 Oct. 1919; *Literary Digest* of 18 Oct. 1919.

**ROOSEVELT**, N. J., borough in Middlesex County, on Rahway River and Staten Island Sound, 16 miles from New York, on the Central of New Jersey Railroad. It gained its present name and status in 1906 when the districts Carteret, Chrome and East Rahway were united in one borough. It has deep sea water frontage and is chiefly a manufacturing city. Its industries include steel works and the manufacture of metal goods, fertilizers, chemicals, cigars, etc. Pop. (1920) 11,047.

**ROOSEVELT DAM**, the greatest engineering work in connection with the Salt River irrigation project in Arizona, which ranks first among the works of the United States reclamation service, was completed in 1910. This wonderful structure of sandstone and cement, costing nearly $9,000,000, rises 284 feet above Salt River, about 75 miles northeast of Phœnix. It is 1,080 feet long on top and 170 feet thick at the base. Placed by the side of a 20-story building, it would rise 10 feet above it, while its length on top would be equal to four blocks on Broadway, New York City. Across its top is a roadway 20 feet wide. The structure is set in a mountain gorge, being in the form of a huge W, closed at the top and bottom, and curved with a bulge up-stream so as to present an arched resistance to the great body of water it has to withhold. Very large stone is used in the dam wall, technically «cyclopean,» and this is securely bonded together and filled in with Portland cement, thus solidifying it into a great monolith. The discharge is through a 500-foot tunnel to six great service gates, each of which will discharge 1,670 cubic feet of water per second. Spillways carry the surplus water around the dam, and serve to relieve it in time of flood. The reservoir created by the Roosevelt dam is the largest artificial body of water in the world. Its capacity is 61,000,000,000 cubic feet, and if its water were spread over the State of Delaware it would cover the entire surface of the State a foot in depth. The lake formed by the dam is 25 miles long, and at its greatest two miles wide. It was formally opened by Theodore Roosevelt 18 March 1911.

**ROOSEVELT MILITARY HIGHWAY, Oregon.** On 3 June 1919 the Oregon legislature passed a measure for the issuance of $2,500,000, provided the Federal government appropriated a similar amount, in order to construct a great highway running along the entire coast of Oregon from the mouth of the Columbia River to the boundary of California, which State has expressed the intention of continuing the road along its coast. The entire highway through both of the States is named in honor of the late Colonel Roosevelt. An association has been formed in the State of Washington to further the scheme, so that, if carried through, the highway will spread along the entire Pacific seaboard of the United States. It is pointed out that the coast of Oregon presents rare attractions to the tourist in its rugged grandeur of scenery, flora and wild fauna.

**ROOT**, root or rụt, **Elihu**, American lawyer and statesman: b. Clinton, N. Y., 15 Feb. 1845. He was graduated at Hamilton College in 1864, and at the New York University Law School in 1867. In the latter year he was admitted to the bar and entered upon the practice of his profession in New York. In 1883 he was appointed United States District Attorney for the southern district of New York; in 1894 was a delegate-at-large to the New York State Constitutional Convention, and was chairman of the judiciary committee. He was appointed Secretary of War by President McKinley in 1899 and reappointed in 1901. He found the work of his department in disorder, with constant rivalry among its various bureaus, but by strict discipline, adherence to civil service rules, and establishing a system of promotion for merit, he soon brought order into the administrative departments, and turned his attention to the organization of the army. In this field he brought about a number of improvements, chief among which are the assimilation of the militia with the regular army and the creation of the General Staff. He also had charge of the military administration of Cuba and the Philippines; and while he was severely criticised for not trying to prevent cruelties in the conquest of the Philippines, he must be given credit for the policy of the army in enforcing sanitary measures and preparing for independent government in Cuba; and for the restoration of order and preparation for civil government and the work of the Philippine Commission in the Philippines. In January 1914 he retired from the secretaryship to resume the practice of law. On 19 July 1905 he was appointed Secretary of State. In 1909 he was elected United States senator from New York, but in 1913 declined to serve further. In 1912 he was permanent chairman of the Republican National Convention at Chicago. He was honored with the 1912 Nobel Peace Prize. In 1915 he presided at the sessions of the New York State Constitutional Convention and in 1916 received 103 votes for the Republican nomination for President of the United States. In 1917 he headed a commission sent by the United States to advise with the Russian government. He has served as president of the Union League Club of New York, the American Bar Association, the American Society of International Law, the board of trustees of the Carnegie Institution at Washington and numerous other distinguished bodies. He has received many eminent degrees from American and foreign universities and societies.

**ROOT, George Frederick**, American musician and composer: b. Sheffield, Mass., 30 Aug. 1820; d. Bailey's Island, Me., 6 Aug. 1896. He was self-taught in his earlier years, but later studied under George J. Webb in Boston. He was instructor in music in the schools of Boston in 1839–44, and director of two churches there. He taught music in New York in 1844–45; studied at Paris in 1850, and afterward was chiefly engaged in composition. From 1859 he was senior member of the Chicago music publishing firm, Root and Cady. Among his many successes are the songs ‹Rosalie, the Prairie Flower›; ‹The Battle Cry of Freedom›; ‹Tramp, Tramp, Tramp, the Boys are Marching›; ‹Just Before the Battle, Mother›; the quartet, ‹There's Music in the Air,› and the cantatas ‹The Fower Queen› (1852) and ‹The Haymakers› (1857).

**ROOT**, that plant part which normally penetrates the soil, absorbs water and chemicals in solution, for nutritive purposes, forces it through the plant and also acts as an anchor and support. Roots, however, in modified forms, may draw nutriment from other vegetation or from the air, and may even serve as support and aid to climbing-plants. Low forms of vegetation and certain submerged aquatics able to absorb water through most of their tissues have no roots, or only enough to act as anchors.

The primary form of root is that which secures the germinating seed to the ground and strikes downward into the soil, sending off branches which rebranch until the ground occupied by the fibrous reticulation is thoroughly exhausted of food. In many cases, however, this single central tap-root, so-called, is missing, and numerous horizontal and lateral roots take its place. The growth of the root-system is commensurate with that of the plant above ground. In epiphytes the roots either adhere to the site of the plant, to hold it in place, or depend freely in the air, drawing nourishment therefrom.

Plants are called annuals, biennials or perennials, according to the length of time the root lives, but the differences are not always absolute, and are often changed by cultivation. Perennials, such as quack grass and peony, often have thickened, tuber-like roots, in which nourishment is stored during the growing periods, to be drawn upon when the plant flowers. Biennials such as beets and carrots show similar development.

Each root is a naked organ, incapable of bearing leaves, which has a blunt apex shielded by a root-«cap» more or less distinct, of old and firm cells. The growing cells of the root lie directly behind this cap, and still farther back is a zone of delicate tubular, one-celled root-hairs, which are devoted to the absorption of liquid foods from the soil and are constantly dying off and being renewed on the side next the root-cap. The growing tip with cap and root-hairs continually advances through the soil, while the older portions become inactive so far as absorption is concerned, thicken, envelop themselves in cork and increase their means of conducting water from the region of the root-hairs to the rest of the plant.

Roots may be produced from stem parts (easiest at the nodes) or even leaves as in *Bryophyllum* and *Begonia*. They are then called adventitious. Familiar examples of adventitious roots are the aerial roots of banyan and mangrove, which start from the branches and eventually penetrate the ground. These roots not only assist in feeding the trees, but also help to support their gigantic heads. Vines, such as the poison-ivy, have masses of aerial rootlets which spring from and fasten the stem firmly to its support.

The haustoria of certain parasitic plants, such as dodder (*Cuscuta*), are forms of reduced roots. They are special organs of absorption which develop from the tissues of the parasite and penetrate the body of the host plant either by means of solvent ferments or the pressure resulting from their own growth or both combined. Once there, they draw sustenance from their host and often dispense with assimilative organs of their own.

Other parasites have disc-like haustoria upon their root-systems, which fasten upon the roots of other plants. Although appearing above ground like self-supporting herbs with green foliage, vigorously assimilative, these plants do not reach full development without this clandestine connection. The young roots of saprophytes, or plants living upon the decaying remains of vegetation, seem to require the coöperation of fungi in obtaining food.

The symbiotic connection of bacteria and leguminous plants is well known. The bacteria penetrate through the root-hairs of the *Leguminosæ* into the cortex of the root and there raise tubercular growths. They draw upon the carbohydrates developed by the host, but being capable of fixing free nitrogen, they exchange this element in elaborated form to the host plant. By plowing the legumes under the ground they decay, returning the nitrogen to the soil in a form available for the next crop. This process, called green manuring, is a good treatment, especially for exhausted, non-nitrogenous soils.

**ROOT,** *in philology.* See SCIENCE OF LANGUAGE.

**ROOT-WORM.** See GRAPE INSECT-PESTS.

**ROPE.** See CORDAGE.

**ROPES, Arthur Reed** («ADRIAN ROSS»), English dramatist and poet: b. Lewisham, Kent, 23 Dec. 1859. He was educated at Cambridge. Among his numerous dramatic productions are ‹Faddimer› (1889); ‹In Town› (1892); ‹Gaiety: a Greek Slave› (1898); ‹San Toy› (1899); ‹The Messenger Boy› (1900); ‹Gaiety: a Country Girl› (1902). He also published ‹Poems› (1884): ‹Short History of Europe› (1889); ‹On Peter's Island,› with Mary E. Ropes (1901), etc.

**ROPES, John Codman,** American military historian: b. Saint Petersburg, Russia, 28 April 1836; d. Boston, Mass., 28 Oct. 1899. He was graduated at Harvard in 1857, and from his admission to the bar in 1861 until 1870 practised law in Boston, but devoted the remainder of his life to historical writing. As the founder of the Military Historical Society of Massachusetts he started the movement for the collection of historical data relating to the Civil War by the United States government. He spent much time also in the collection of material bearing upon the life of Napoleon. His published books are ‹The Army Under Pope› (1881); ‹The First Napoleon› (1885); ‹The Campaign of Waterloo› (1893–94), and ‹The Story of the Civil War› (1894–99).

**ROPS,** rōps, **Félicien,** Belgian artist: b. Namur, 1833; d. 1898. His illustrations for the *Crocodile,* a journal published at Brussels, appeared for the first time in 1855 and established his reputation as an artist of original genius. But his main employment from that date was book illustration, and many novels of the day have been published with his brilliant pictures, which reflect the cynical spirit of some modern literature with great imaginative power. Many of his drawings are, however, too sheerly naked and unreserved to be pleasing. But his etchings are almost unique in power of execution, especially the series known as ‹Sataniques› which while they belong to decadent art are masterpieces of technique. He founded the International Society of Etchers at Brussels and has had a great influence on modern schools of art in Europe. Consult Ramiro, ‹Catalogue dé l'Œuvre Gravé de Félicien Rops› (1887), and Mascha, ‹Catalogue› (Munich 1910).

**ROQUE,** rōk. Croquet and roque are two varieties of the same game. Croquet is played upon a grass lawn on which the boundaries of a rectangular court are indicated by a chalk line or by a slight ridge. Roque, however, is a much more scientific variety of the game. The court is 72 feet long and 32 feet wide, rectangular, with each corner, for eight feet, cut off diagonally. The surface is well-rolled dirt sprinkled with sand. It is surrounded with rubber cushions so that caroms can be made off the balls the same as they are in billiards. All the arches, of which there are eight, are three and a half inches in diameter. In the centre of the court is a tunnel or cage the arch of which is three and one-eighth inches, and it is 18 inches in length. The balls are of hard rubber and are three and a quarter inches in diameter. The mallets' heads are seven and a half inches long by two and a quarter to two and a half inches in diameter, with a handle from 8 to 15 inches long. Only two players play against each other, each playing two balls. A national championship is held annually in the United States. See CROQUET.

**ROQUEFORT,** rōk-fōr, France, a village in the department of Aveyron in the vicinity of which large quantities of the well-known variety of cheese of the same name are made from ewe milk. Pop. 1,150.

**ROQUEPLAN, Joseph Etienne Camille,** zhō-zĕf ā-tē-ĕn kä-mēl rōk-plän, French painter: b. Mallemort, Bouches-du-Rhône, France, 1802; d. 1855. He studied at Paris under Gros and Pujol. His two pictures exhibited at the Salon of 1827 and illustrative of Sir Walter Scott's writings won him a place among the leaders of modern French painting. His most remarkable works include ‹The Amateur Antiquary,› and ‹The Well Near the Tall Fig-Tree.› He was equally successful in genre and landscape, and his faithful transcripts of Pyrenean scenery are among the most delightful of modern French pictures.

**ROQUETTE,** rō-kĕt', **Otto,** German author, critic and poet: b. Krotoschin, Posen, 19 April 1824; d. Darmstadt, 18 March 1896. Educated at Heidelberg, Berlin and Halle, he taught at Dresden until his 39th year, at Berlin in 1862–69, and then in the Darmstadt Technische Hochschule, where he was professor of German language, literature and history. He wrote an excellent history of German literature (1872; 4th ed., 1882); the novels, ‹Im Haus der Väter,› ‹Das Buchstabirbuch der Leidenschaft› and ‹Die Prophetenschule›; two volumes of dramatic poems (1867–76). His allegoric tales in verse, ‹Waldmeisters Brautfahrt› (77th ed., 1905), was his greatest and most popular work. It was followed by other lyrics and tales. Consult his autobiography, ‹Siebzig Jahre› (Darmstadt 1893).

**RORAIMA,** rō-rä'ē-mä, a mountain of South America, in lat. 5° N., on the boundary of British Guiana and Venezuela, part of the Pacaraima range. It is 8,740 feet high, the top forming a rugged rocky plateau, and the steep rocky sides render the summit almost inaccessible. It was ascended in 1884 by Im Thurn. The flora and fauna of the summit are scanty.

**RORER, Sarah Tyson,** American teacher of domestic science: b. Richboro, Pa., 18 Oct. 1849. She was graduated from the academy at East Aurora, N. Y., and was married in 1871 to W. A. Rorer. She was for many years principal of the Philadelphia School of Domestic Science, and she lectured widely. She was editor and part owner of *Table Talk* in 1886–92, edited *Household News* in 1893–97 and was later on the editorial staff of the *Ladies' Home Journal.* She was a director of the Pennsylvania Chautauqua School of Domestic Science. Her publications include ‹Mrs. Rorer's New Cook Book›; ‹How to Use a Chafing Dish›; ‹Colonial Cookery›; ‹A Book on Diet and Cookery,› etc.

**RORIC FIGURES** (Fr. *figures roriques,* from Lat. *ros,* dew), a name applied to certain curious images rendered manifest upon breathing on polished solid surfaces, when these have been previously exposed to contact or close proximity of the objects thus represented, and at the same time have been acted upon by light, heat or electricity. The singularity of these phenomena is, that they consist usually in the production at the first of a sort of latent or invisible image, but this may afterward be developed or brought out, somewhat in the manner of photography. Consult Chwolson, O. D., ‹Lehrbuch der Physik› (1902).

**RORKES** (rôrks) **DRIFT,** Africa, a post station on the Tugela River, in Natal, memorable for the heroic defense of a British force of 80 men under Lieutenants Bromhead and Chard. They were guarding the hospital and the commissariat, when they were attacked by a Zulu force of 4,000, the night of 22 Jan. 1879. The British used biscuit boxes and rice bags for a barricade and kept the enemy at bay until relieved the morning of the 23d. Six times in succession the little force drove out Zulu warriors who had got within the barricade.

**RORQUAL,** rôr'qwạl, a name of Scandinavian origin, signifying a whale having longitudinal furrows on the belly. As generally employed it comprises the finback, sulphurbottom and humpback whales, or the subfamily *Balænopteridæ,* exclusive of the genus *Rhachianectes.* The furrows extend to the throat, where they are closely laid. All these whales have small heads and small flippers. In the north Atlantic there are three species of finbacks, one species of sulphurbottom and one species of humpback. The finbacks are the common finback (*Balænoptera physalus*), the pollack whale (*B. borealis*) and the little piked whale (*B. acuto-rostrata*). The whale which is most frequently seen on the east coast of the United States and of which stranded individuals are found every year at different points is the common finback, *B. physalus.* It is from 60 to 70 feet long when full-grown, and is readily distinguishable by its gray and white striped whalebone, gray upper surfaces and white belly and under surfaces of pectoral fins and flukes. The dorsal fin, which is rather more than a foot high, is situated a little in advance of the last fourth of the length of the body. Though numerous species of finbacks and humpbacks have been described from different parts of the world, the five forms above mentioned are everywhere recognizable. If others exist they at least resemble these very closely. The sulphurbottom feeds on small crustaceans and the finbacks and humpbacks on various fishes, such as the cod, pollack, herring, capelin, etc. They all engage in seasonal migrations. During the summer months great numbers congregate about Newfoundland, Iceland and the north of Norway. For gray whale, or hardhead, and further information relating to finbacks and humpbacks, see WHALE.

**RORY O'MORE,** rŏr'ĭ o-mor', a novel by Samuel Lover, published in 1836. In spite of its stilted style and improbable incidents, this story is valuable in its delineation of Irish character and in its picture of the Irish uprisings at the close of the 18th century.

**ROSA, Edward Bennett,** American physicist: b. Rogersville, N. Y., 4 Oct. 1861; d. Washington, D. C., 17 May 1921. He was graduated at Wesleyan University in 1886; Ph.D. at Johns Hopkins in 1891. He was professor of physics at Wesleyan University in 1891–1902; physicist of the National Bureau of Standards in 1901–10, and thereafter was its chief physicist. He contributed to journals of physics, and was author of the papers of the National Bureau of Standards, in which he instituted a special department of theoretical and applied electricity and electrical measurements. In 1915 he was appointed a member of the United States Coast Defense Board. He wrote ‹The Specific Inductive Capacity of Electrolytes› (1892); ‹Descriptions of a New Respiratory Calorimetre› (1899), etc.

**ROSA, Francisco de Paula Martinez de la,** Spanish poet, novelist, dramatist and statesman: b. Granada, 10 March 1788; d. Madrid, 7 Feb. 1862. Graduating in law from the University of Granada he became lecturer on ethics at his alma mater, while still in his 'teens. He was popular as a lecturer on account of his originality in the handling of his subjects, his enthusiasm and his wide knowledge of literature. He had scarcely entered upon his duties at the university when he began the publication of a series of epigrams on well-known local personages, under the title of ‹El cementerio de momo.› This gained him considerable reputation as a writer. But his university and other duties were interrupted by the arrival of the French in Spain. De la Rosa became very active in the national movement against the invaders. Deep in the councils of the Junta of Granada, he undertook for that body to secure arms from the English who were busy fighting Napoleon. In complying with this self-imposed task, he went first to Gibraltar and then to England. He was possessed of notable oratorical gifts and this enabled him to exercise a certain amount of influence in political juntas, which his otherwise retiring character would not have permitted him to do. This in turn brought for him political offices and a leadership in literature which he was not in reality able to maintain in his later years. Yet this combination of circumstances had two directly opposite effects. It gained for him during his lifetime the reputation of being in his day Spain's greatest and most representative literary man and gave him the literary leadership of his country. This latter position he maintained not so much through his gifts of originality in thought, literary form and subject matter, as by his successful imitation of his favorite authors not in Spanish alone, but also in foreign languages, more especially French and English. The second effect has been that since his death and in consequence of the public and political glamor that surrounded his name in his lifetime his works have become largely neglected; and they have found more critics to pick flaws in them than to recognize their many good qualities. For his political activities and especially for his advocacy of the constitution of 1812, Martinez de la Rosa was tried and sentenced to imprisonment for 10 years, on the political reaction of 1814. He served six years of this sentence which was cut short by the insurrection of 1820. He came forth from his prison to become head of the new ministry; but he proved himself far too weak a character for the stormy part to which fate had assigned him, and his temporizing attitude made him very unpopular and distrusted by both political parties and by the masses as a whole. Resigning office, he went to Paris, where he remained until 1830. Four years later he became head of the liberal ministry. In this capacity he showed his reactionary tendencies by becoming author of a royal statute creating a constitutional government and doing away with the ancient privileges of the provinces. Active though he was in promoting the interests of Spain, he succeeded in making himself fully as unpopular as he had during his first term as head of the government; and he was again forced to resign his office, this time before the end of his first year of service. He, however, continued to be a supporter of the queen, Maria Christina, and on the fall of her government in 1840 he retreated to Paris. He returned to Madrid four years later, as the result of political changes, entered the cabinet of Narvaez (1844), and three years later became Ambassador to Paris (1847–51). His long residence in the French capital made him a champion of the Romantic movement in literature, which he was instrumental in introducing into Spain. Martinez de la Rosa was very sensitive to the influence of his favorite authors, and he reflects them in turn, as one after another obtained ascendency over him. For this reason he was well fitted for the task of introducing his countrymen to the literary movement that had taken possession of the French capital and through it of all France. Experimenting, as he constantly was, with the works of others, his literary efforts increased in excellence toward the close of his life. Among his published works most worthy of attention are ‹Doña Isabel de Solis› (an imitation of Scott); ‹La viuda de Padilla›; ‹Los celos infundados›; ‹La conjuración de Venecia›; ‹Aben-Humeya›; ‹Lo que puede un empleo,› and ‹Espiritu del siglo.› Consult Godard, ‹Martinez de la Rosa› (Paris 1862).

**ROSA,** rō'sä, **Salvatore** or **Salvator,** Italian painter: b. Renella, near Naples, 20 June 1615; d. Rome, 15 March 1673. His eldest sister having married Francesco Fracanzano, a painter, Salvator from him acquired a taste for art. He then became a pupil of Falcone and Ribera (q.v.); but his taste was formed by the study of nature among the wilds of the Apennines rather than by other artists. During one of his rambles in the Abruzzi he was seized by brigands with whom he is said to have associated for some time, but left them at last and went to Naples, where he worked in such want that he was often obliged to sell his pictures to the meanest hucksters and for a pittance. At last one of his pictures was observed by the painter Lanfranco who recommended Salvator to notice, and procured him patronage. He removed to Rome, where he established his reputation. In 1647, when the revolt under Masaniello occurred, he joined *La Compagnia della Morté,* which Falcone commanded, and on the defeat of the cause he returned to Rome, where he was not, however, permitted to remain. He went to Florence, where he was patronized and employed by the grand duke and other members of the family of Medici. At length, returning to Rome on the death of his enemies, he painted many pictures for the churches in that city. His great ambition was to be a famous historical painter, but he is actually best known as a painter of landscapes and battles. His landscapes present wild and desolate scenery, with rocks rising like towers; broken, splintered tree trunks waving their leafless arms; storm and lightning convulsing the heavens. The figures introduced are those of bandits, soldiers or witches. Among his extant works are ‹Prometheus,› ‹Belisarius,› ‹Saint Roche Wounded,› some landscapes and battle-scenes, in Rome; ‹Jesus Disputing with the Doctors,› ‹Daniel in the Lion's Den,› ‹Jesus Walking on the Water,› in Naples; ‹Souls in Purgatory,› in Milan; ‹Conspiracy of Catiline,› and his own portrait, in Florence; ‹The Soldiers of Gideon,› ‹Bandits in Council,› ‹Saint Jerome in the Desert,› and some landscapes, in Munich; ‹Mercury and the Woodman,› ‹Landscape with Figures,› in the National Gallery; ‹Moses at the Rock,› ‹Halt of the Soldiers,› at Hampton Court; ‹Prometheus,› ‹Sisyphus,› at The Hague; ‹Regulus,› ‹Cadmus,› at Copenhagen; ‹The Prodigal Son,› in Petrograd; ‹The Angel Raphael,› ‹The Young Tobias,› ‹The Shade of Samuel Appearing to Saul,› in the Louvre; ‹Jesus in the Garden of Olives,› ‹Resurrection of Christ,› in Toulouse. He was also distinguished as a poet and musician, and his satires and other poems have been often printed.

**ROSA, Monte,** mŏn'tē rō'sä (ancient Mons Sylvius), a mountain of the Alps (q.v.), on the boundary between Italy and Switzerland, near the Matterhorn, and about 40 miles east of Mont Blanc (q.v.). It is formed by the union of several mountain ridges. Where the ridges meet four chief angles are formed, the one on the northeast, which is most precipitous, enclosing the glacier of Macugnaga, another on the northwest originating the great Gorner glacier or glacier of Zermatt, a third on the southwest containing the glacier of Lys, and the fourth on the southeast occupied by several large but less prominent glaciers. The loftiest peak, Dufourspitze, 15,217 feet in height, was first ascended in 1855. There are three other peaks, respectively, 15,132, 15,005 and 14,965 feet high.

**ROSA AMERICANA,** *in numismatics,* the name applied to a coinage issued in 1722 by Great Britain for America of a mixed metal resembling brass, and called Rosa Americana or Wood's money, after its manufacturer, William Wood. The royal letters patent described this money as two-pence, pence and half-pence. See NUMISMATICS.

**ROSACEÆ,** rō-zā'sē-ē, the Rose family, perhaps the most important natural order of fruit-bearing plants, since it includes apple, pear, quince, peach, plum, apricot, cherry, nectarine, raspberry, dewberry, loganberry, blackberry, strawberry, loquat, medlar and countless ornamental trees and shrubs. The family is composed of about 90 genera and 1,500 species widely distributed throughout the world, though most abundant in the north temperate zone. It is divided into six sub-families, which by some authors are considered as distinct families. The basis of subdivision is the formation of the fruit as follows: Fruit follicular, as in *Spiræa;* ovary compound, inferior, fruit fleshy as in *Pyrus*; fruit of achenes as in *Rubus*; carpels connate and adnate to the hollow dry receptacle, as in *Geum;* carpel solitary, superior, fruit a drupe, style terminal, as in *Prunus;* carpel solitary, superior, fruit a drupe but style basal and flowers usually irregular, as in *Chrysobalanus.* The species agree in having alternate, simple or compound leaves, accompanied by two persistent stipules, a calyx of one sepal, with four or five divisions, and the corolla with as many petals as the calyx has divisions, but sometimes wanting. The stamens are generally very numerous and distinct, and are inserted with the petals round the ovary. The pistil presents various modifications. Sometimes it is formed of a single carpel or several entirely free and distinct carpels, placed in a tubular calyx. Sometimes these carpels adhere by their outer side to the calyx; sometimes they are united, not only to the calyx but to each other, and sometimes they are collected into a kind of capitulum or head. The fruits, consequently, are highly varied, and their modifications afford the chief distinguishing marks of the suborders.

**ROSACEA, ACNE ROSACEA,** or **GUTTA ROSEA.** See ACNE.

**ROSALES,** rō-sä'lĕs, Philippines, pueblo, province of Neuva Ecija, Luzon, on a tributary of the Agno River, two miles from its junction with the Agno, 38 miles north of San Isidro. It is connected by highway with Manila and with towns to the north. Pop. 11,519.

**ROSAMOND,** rŏz'ạ-mŏnd, English mistress of Henry II, commonly called «fair Rosamond.» She was the daughter of Walter, Lord Clifford, became the mistress of Henry II and died probably about 1176. The king is said to have set apart for her residence a building surrounded by a labyrinth at Woodstock. The intrigue was finally discovered by the jealous Queen Eleanor, who forced her to drink poison. These details, however, have no historic basis. She was buried in the chapter-house of Godstowe nunnery, where her tomb was long to be seen.

**ROSANILINE,** a derivative of aniline (q.v.), the base of magenta, fuchsine (qq.v.), etc. It is a colorless substance, having the formula $C_{20}H_{21}N_{3}O$. Many of its crystalline salts are of very brilliant colors.

**ROSANOFF, Martin André,** American chemist: b. Nikolaieff, Russia, 28 Dec. 1874. He was educated at the Imperial Classical Gymnasium, Nikolaieff, and at the universities of New York, Berlin and Paris. He was research assistant to Thomas A. Edison in 1903–04; instructor, and later head, of the department of chemistry, at New York University in 1904–07, and was head of the department of chemistry and the chemical laboratories at Clark University in 1907–14. He was called to the chair of chemical research at the University of Pittsburgh in 1914, and since 1915 has also been head of the department of research in pure chemistry there.

**ROSARIO,** rō-sä'rē-ō, Argentina, in the province of Santa Fé, on the right bank of the Paraná, lies about 230 miles by river northwest of Buenos Aires. It is the second city of the republic in commercial importance and the centre of the entire trade for the 11 provinces lying between Paraná and the Andes. It is the largest river port in the Argentine. Six railways meet here, and river navigation is well developed. Grain elevators and large warehouses accommodate the wheat, hides and produce from the interior. The city is well laid out, on level ground, and has sewers, waterworks, electricity, gas and all modern improvements. There are 18 banks and private bankers, and good newspapers. Many handsome buildings are of recent construction, such as the new courts, theatre, banks and hotels. The residence sections are attractive and finely kept. There are sugar refineries, grist mills and breweries. A large amount of money has been expended in conveniences for transfer of freight from water to rail, and the port trade has responded with a rapid development. The foreign trade approximates $100,000,000 annually. The most important items of import are lumber, oil, machinery and canned goods. Pop. about 200,000.

**ROSARIO,** Philippines, pueblo, province of Batangas, on the southeastern coast at the mouth of the Rosario River, 13 miles northeast of Batangas, the provincial capital. It is an important road centre. During the last insurrection the town was destroyed by the insurgents. Pop. 12,450.

Also the name of two smaller pueblos in Luzon: (1) in the province of Cavite, on the Manila coast road, eight miles southwest of the town of Cavite, pop. 6,390; (2) in the province of Union, situated in a mountainous district, 30 miles southeast of San Fernando, connected with coast highway; pop. 2,250.

**ROSARY OF THE BLESSED VIRGIN MARY,** a form of devotion in the Catholic Church, which consists in the recital of 15 decades of Aves (see AVE MARIA) each decade preceded by a Paternoster and followed by a Gloria (see DOXOLOGY). As the prayers are said they are counted off on a string of beads. Five decades form a chaplet and in each chaplet are contemplated events or «mysteries» connected with the life of Christ: the mysteries of the first chaplet are the Annunciation, Visitation, Birth of Christ, his Presentation in the Temple and his Finding there: these are the Joyful Mysteries. In the other chaplets are contemplated the Five Sorrowful Mysteries — the Agony in the Garden, Scourging, etc.; and finally the Five Glorious Mysteries — Resurrection, Ascension, etc. The Rosary of 15 decades was introduced by Saint Dominic in the 13th century.

**ROSARY SUNDAY,** the first Sunday in October; a feast instituted by Gregory XIII for the Confraternity of the Rosary and made of universal observance after the victory of the Emperor Charles VI over the Turks at Lepanto in 1571 in gratitude to the Blessed Virgin. This victory is supposed to be in answer to the prayers of the Fraternity of the Rosary, a Roman Catholic order established in the 15th century for the purpose of averting public calamity by the means of prayers. An impetus was also given to the devotion of the rosary by Leo XIII, who enjoined its daily use in public during October. Roses are blessed and distributed as souvenirs and the rosary is recited continually during the day.

**ROSAS, Juan Manuel de,** hoo-än′ mä-noo-ĕl dā rō′säs, Argentine dictator: b. Buenos Aires, 30 March 1793; d. near Southampton, England, 14 March 1877. He was descended from a noble family of Spain and first came into public notice as leader of the Republicans against the Aristocratic party of the Unitarios. He was commander of the police of Buenos Aires in 1826, but the revolution headed by Lavalle forced him to retire. He succeeded a little later in overcoming Lavalle and becoming governor, 1829–32. Though forced out of office, he held control of the army and in 1835 became dictator for five years. His appointment was twice renewed and until 1852 no meetings were held of the National Congress or the Constituent Assembly. Rosas exercised a despotic rule and attempted to annex the neighboring states by force under the pretext of their formerly belonging to the vice-royalty of Buenos Aires. He took advantage of the rivalry of Oribe and Rivera to intervene in the affairs of Uruguay, made an unsuccessful invasion in 1839 after the fall of Oribe's government and repeated the attack in 1843. A long siege followed with the closing of the Paraná to navigation and the violation of the treaties of 1828 and 1840 finally led to combined interference on the part of England and France. Buenos Aires was blockaded, but little was effected save the opening of the Paraná, as the river provinces could not be induced to rise against Rosas. England withdrew in July 1848 and France six months later. The opposition party against Rosas was growing more powerful, however, and the treaty of 1849 which denied to the neighboring provinces navigation privileges of the Plate, the Uruguay and the Paraná finally brought to his opponents the support of Brazil, and Rosas was defeated at Monte Caseros, 3 Feb. 1852. He made his escape to England, where he lived the remainder of his life. The Argentine Congress passed sentence of death upon him in 1861 as «a professional murderer and robber.» Consult Mejia, Ramos, ‹Rosas y su tiempo› (2 vols., Buenos Aires 1907).

**ROSCELIN,** rŏs-ĕl-ăṅ, **ROUSSELIN,** or **RUCELIN, Jean,** French theologian of the 11th century: b. probably in the diocese of Soissons. He was educated at Rheims, and came into public notice while canon of Compiègne by citing Anselm as supporting his view of the Trinity, which in effect conceived God as existing as an individual and consequently the Trinity as three Gods. The synod of Soissons in 1092 compelled Roscelin to recant, after receiving from Anselm a refutation and denial of Roscelin's position and claims. Continuing to teach his peculiar views, he was deposed. He went to England to attack Anselm, then archbishop of Canterbury, at the opportune moment of his difference with the king, but failing in his purpose returned to France. Later he settled at Tours and entered into a controversy with Abelard, his former pupil, on the grounds taken by the latter in maintaining the unity of the Trinity. After this controversy Roscelin disappears from history. Of his writings only a letter to Abelard is extant. In the history of philosophy he is classified as a nominalist and in theology as a tritheist.

**ROSCHER,** rōsh′ĕr, **Wilhelm,** German political economist: b. Hanover, 21 Oct. 1817; d. Leipzig, 4 June 1894. Following Savigny, who introduced into Germany the historical treatment of jurisprudence, Roscher broke with the theoretical economists and entered on the study of the history of economics, treating political economy less as an abstract science and more as a branch of history, and making economic fact and past development rank as mere economic ideas and theories. From 1848 he was professor at Leipzig. His two great works are ‹System der Volkswirtschaft› (5 vols., 1854–81) and ‹Geschichte der Nationalökonomik in Deutschland› (1874). Other volumes on forestry, commerce, charities, etc., were ‹Zur Geschichte der englischen Volkswirtschaftslehre› (1852); ‹Ueber Kornhandel und Teuerungspolitik› (3d ed., 1852); ‹Kolonien Kolonial-politik, und Auswanderung› (3d ed., 1885); ‹Ansichten der Volkswirtschaft aus dem geschichtlichen Standpunkt› (1861; 3d ed., 1878); ‹Politik› (1892); ‹Geistliche Gedanken eines Nationalökonomen› (1894).

**ROSCIUS,** rŏsh′ĭ-ŭs, Roman actor: b. Colonium, near Lanuvium, 134 B.C.; d. about 61 B.C. He was born a slave and early adopted the histrionic profession for his master's profit, His success on the stage was phenomenal. It is said that at one time he earned 1,000 denarii (about $175) daily, and Pliny estimates his annual profits at 50,000,000 sesterces (about $2,000,000). This may be exaggerated, but he was a favorite actor at a period when the Roman passion for the stage was at its height. He was easily enabled to purchase his freedom from his *peculium,* or perquisites as a slave, took the name of Quintus Roscius Gallus and wore the emblem of equestrian rank, a gold ring, given him by Sulla. The Roman populace and nobles he moved with equal facility to tears or laughter by his irresistible histrionic power, for while he was a tragedian unparalleled in the history of the ancient Roman stage, he was also a comedian of fresh and natural humor. Cicero did not disdain to receive instructions from the great actor, whom the first orator of Rome always spoke of in terms of affection and admiration.

**ROSCOE,** rŏs'kō, Sir **Henry Enfield,** English chemist: b. London, 7 Jan. 1833; d. 18 Dec. 1915. He was educated at University College, London, and at Heidelberg, making a special study of chemistry. He occupied the chair of chemistry at Owens College, Manchester, in 1857–87. He was knighted in 1884, sat in Parliament for South Manchester in 1885–95, and in 1896–1902 was vice-chancellor of the University of London. He received high honors from the universities and learned societies of England and published ‘Investigations on the Chemical Action of Light’; ‘Lessons in Elementary Chemistry’ (1871); ‘A Treatise on Chemistry’ (1878–89); ‘The Hydrocarbons and Their Derivatives,’ with Schorlemmer (1881–92), etc. His ‘Life and Experiences’ were published in 1906.

**ROSCOE, William,** English biographer: b. near Liverpool, 8 March 1753; d. Toxteth Park, Liverpool, 30 June 1831. At 16 he was articled to an attorney in Liverpool, and this obliging him to study Latin, he read and made himself master of the Latin classics. He next studied the Italian and French languages, and in the former became uncommonly proficient. Having finished his clerkship, he was taken into partnership by an attorney of considerable practice and carried on the whole of his business. In 1777 he published a collection of some of his earlier poems and when the question of the slave-trade came uppermost Roscoe took a warm part in favor of its abolition and joined Clarkson in his endeavors to that end. His ‘Scriptural Refutation of a Pamphlet on the Licitness of the Slave-Trade’ and his ‘Wrongs of Africa’ appeared in 1788; and in 1796 he brought out the work which gained him celebrity, the ‘Life of Lorenzo de' Medici, called the Magnificent’ (1795), since translated into Italian, French and German. He published the ‘Life and Pontificate of Leo X’ in 1805, and in 1806–07 represented Liverpool in Parliament. He had previously entered into business at Liverpool as a banker, a move which eventually landed him in great pecuniary difficulties. He was the author of several political pamphlets and the mover and supporter of several public works in Liverpool. To the botanic garden and to the Athenæum he lent much effective assistance. Consult his ‘Life and Correspondence’ (1833) by his son, Henry Roscoe.

**ROSCOELITE,** a vanadium-bearing mica (muscovite) in which part of the $Al_2O_3$ is replaced by $V_2O_3$, the latter reaching 28.85 per cent in some specimens. It occurs in thin layers with gold near Coloma, Cal., and at various localities in central and western Colorado.

**ROSE,** rōz, **Chauncey,** American philanthropist: b. Wethersfield, Conn., 24 Dec. 1794; d. Terre Haute, Ind., 13 Aug. 1877. In 1825 he settled in Terre Haute as a merchant, where by his investments in land he became wealthy. He was an active promoter of railroad interests and was especially interested in the Terre Haute and Indianapolis Railroad. Though legally entitled to the fortune of his brother John, he disposed of almost the entire amount of $1,600,000 in benevolent enterprises which he knew his brother to have favored, and later founded from his own fortune the Rose Polytechnic Institute to which he left the greater share of his estate.

**ROSE, George** («Arthur Sketchley»), English dramatist and novelist: b. London, England, 19 May 1817; d. there, 11 Nov. 1882. He was graduated at Oxford in 1845, took orders in the Church of England in 1848 and after holding several curacies became in 1855 a Roman Catholic. He then engaged in tutoring and later devoted himself to a literary career in which he achieved a considerable success. His ‘Mrs. Brown’ monologues were published in 32 volumes (1866–70) and enjoyed wide popularity. His other works include novels, ‘A Match in the Dark’ (1878); and ‘A Marriage of Conscience’ (1879); plays, ‘The Dark Cloud’ (1863); ‘How Will They Get Out of It?’ (1864); ‘Money Makes the Man’ (1870); and also several works of travel, ‘The Great Country, or Impressions of America’ (1868); ‘Out for a Holiday’ (1870), etc. Consult Winter's ‘Old Friends’ (1909).

**ROSE,** rō'zĕ, **Gustav,** German mineralogist, brother of Heinrich Rose (q.v.): b. Berlin, 28 March 1798; d. there, 15 July 1873. He studied under Berzelius at Stockholm, in 1822 became keeper of the mineralogical collection in the University of Berlin, and in 1826 was made extraordinary and in 1839 ordinary professor of mineralogy in that institution. Beside several essays in Poggendorff's ‘Annalen,’ he wrote ‘Elemente der Krystallographie’ (1833); ‘Ueber das Krystallisationsystem des Quarzes’ (1846); ‘Das Krystallochemische Mineralsystem’ (1852). With Humboldt and Ehrenberg he made in 1829 a journey to northern Asia, an account of which he gave in a work entitled ‘Reise nach dem Ural dem Altai und dem Kapische Meere’ (1837–42).

**ROSE, Heinrich,** German chemist: b. Berlin, 6 Aug. 1795; d. there, 27 Jan. 1864. He first devoted himself to pharmacy, studied in Berlin, in Stockholm in 1819 under Berzelius, and from there went to Kiel, where he took his degree. In 1823 he became extraordinary and in 1835 ordinary professor of chemistry at Berlin. As a practical analyst in the department of inorganic chemistry he held a high rank, and the result of his labors can be found in his memoirs inserted in the ‘Annalen’ of Poggendorff. His ‘Manual of Analytical Chemistry’ (1829) was translated into French, English and Swedish. In 1844 he discovered a new metal in the tantalites of Bavaria which he called niobium.

**ROSE, Hugh Henry,** Lord Baron Strathnairn, English soldier and diplomatist: b. Berlin, 6 April 1801; d. Paris, 16 Oct. 1885. He entered the British army in 1820, was military attaché to the Turkish army in 1840, was consul-general for Syria 1841–48, as secretary to Lord Stratford de Radcliffe was chargé-d'affaires at Constantinople in 1852–54 and was commissioner at the French headquarters during the Crimean War and served at the Alma and Inkerman. He was sent to India in 1857 to command the Central Indian army and virtually reconquered Central India. Though his campaign was overshadowed by that of Sir Colin Campbell, it is generally admitted that his operations were more skilful and brilliant than his chief's, on whose death he became commander-in-chief in India. He held the same post in Ireland 1865–70, was raised to the peerage in 1866 and made field-marshal in 1877. Consult Burne, Sir O. T., 'Clyde and Strathnairn' (1891).

**ROSE, Hugh James,** English theologian: b. Little Horsted, Sussex, 1795; d. Florence, 22 Dec. 1838. He was graduated at Trinity College, Cambridge, in 1817; was professor of divinity at the University of Durham in 1833; and in 1836 principal of King's College, London. He was one of the leaders of the Oxford movement, and it was at his rectory, Hadleigh, Suffolk, in July 1833, that a resolution was made to publish 'Tracts for the Time.' «He was,» says Dean Church, «the most accomplished divine and teacher in the English Church. He was really a learned man. He had the intellect and energy and literary skill to use his learning. He was a man of singularly elevated and religious character; he had something of the eye and temper of a statesman, and he was profoundly loyal to the Church.» It is not too much to say that by his early death the Tractarian movement lost its balance wheel. (See OXFORD MOVEMENT). Consult Church, 'The Oxford Movement' (1891); Mozley, 'Reminiscences.'

**ROSE, SIR John,** Canadian financier: b. Turriff, Aberdeenshire, 2 Aug. 1820; d. Caithness-shire, 24 Aug. 1888. He was educated at King's College, Aberdeen, and in 1836 removed with his parents to Canada. He served as a volunteer during the rebellion of 1837. In 1842 he was admitted to the bar and soon established a large practice at Montreal. He entered Parliament as member for Montreal in 1857, and after the Union until his retirement in 1869 represented Huntingdon. He was solicitor-general for Lower Canada in 1857, minister of public works in 1859 and in 1864 was appointed commissioner for the settlement of claims under the Oregon treaty with the United States. In 1867–69 he was minister of finance, then retired from office, went to England and engaged in banking. He represented the English government on a confidential mission to the United States which led to the Treaty of Washington in 1870, and until his death was regarded as the unofficial representative of Canadian interests in England. He was created a baronet in 1872 and in 1886 was made an imperial privy-councillor.

**ROSE, John Holland,** English historian: b. Bedford, 1855. He was graduated at Cambridge University, received a fellowship at Christ's College and since 1911 has been reader in modern history at Cambridge. Besides much editorial work and contributions to the 'Cambridge Modern History' he is author of 'The Revolutionary and Napoleonic Era' (1897); 'Life of Napoleon' (1902); 'William Pitt and the Great War' (1915); 'Nationality a Factor in Modern History' (1916); 'Why We Carry On' (1918), etc.

**ROSE, Joseph Nelson,** American botanist: b. near Liberty, Ind., 11 Jan. 1862. He was educated at Wabash College and was assistant in botany there in 1888–89. He was first assistant in the division of botany of the United States Department of Agriculture in 1888–94; assistant and later associate curator of the United States National Museum in 1894–1912, and since then associate in botany there. He is also research associate of Carnegie Institute, Washington. He has made an exhaustive study of cacti. He was joint editor of 'Revision of the Umbelliferæ of the United States' (1888); and of 'Revision of North American Crassulaceæ' (1905). Besides numerous articles in technical journals on Umbelliferæ, Cacticeæ and Mexican plants, he is author of 'Useful Plants of Mexico' (1899); 'Monograph of North American Umbelliferæ' (1901).

**ROSE.** See ROSACEÆ; ROSES.

**ROSE, Attar of.** See ATTAR OF ROSES.

**ROSE IN ART AND SYMBOLISM, The.** The Bible but twice mentions the rose, and modern criticism tends to prove that in both cases it is a mistranslation and refers to some other growth. In the Song of Solomon the «rose of Sharon» is mentioned. In historical reference we find the rose mentioned as of religious significance already in the ancient Zendavesta, and it was held in reverence by ancient Indians, Syrians and Egyptians. But the rose does not appear as a motif in Egyptian art, though the Babylonians had their staves ornamented with silver roses as tokens of festivity. In the heathen mythology the rose was dedicated to Aphrodite and was claimed either to have been created from the blood of Adonis or to have been caused by the sea-foam dropping from the newly-created Aphrodite bursting into bloom. In mythological evolution the rose became a symbol of Eros, later of the Muses and of the Graces. Dionysus (Bacchus) also had a rose as attribute, hence this flower decorated the guests at banquets. In this context it may be mentioned that the rose has always been the queen of wreath-flowers and ornamental expression of beauty. In antithesis the rose was a symbol of decay; hence an emblem of death. Originating in the Orient the rose became a popular growth with the Greeks, who in turn carried its cultivation into their colonies in Italy and elsewhere. The *ephebes* in their youthful capacity as servers of wine to the guests wore roses on their heads as did also the female dancers. In the orgies following the banquet roses were used in great abundance, smothering the tables, and the Latin term *sub rosa* is said to have originated from the rule that all acts after the arrival of the flowered decoration were considered secret with the convivialists. Nero is said to have squandered $150,000 in roses at a single feast; the sybarites are said to have reposed on a bed of roses. In Christian iconography we find the rose and blood of Christ brought into close symbolic correlation and in the Catacombs the rose and wreath of roses are pictured as symbols of martyrdom. In ecclesiastical art we early find the Holy Virgin symbolized by the rose (*rosa mystica*) and one of her titles became in Italy Santa Maria della Rosa. The flower is often found in her hand in early paintings. Another one of the Virgin's titles is *Rosa Cœli,* the Rose of Heaven. Ever since the Middle Ages the Pope has, on Lætare Sunday, blessed a golden rose which he bestows to some beneficiary. Some Italian writers have declared that the term *sub rosa* is derived from the fact of the Pope presenting (since 1526) consecrated roses which were placed over the confessionals at Rome to denote secrecy, the rose being a symbol of silence. In legend, Saint Dorothea, who suffered martyrdom under Fabricius, made a convert of Theophilus by sending him some roses from Paradise. The rose is an attribute of the saints: Casilda, Elizabeth of Portugal, Rose of Lima, Rose of Viterbo, Rosalia and others.

In heraldry the rose is blazon of the *difference* or *brisure* of the seventh son. The heraldic rose is depicted without leaves or stem and has five petals but the *rose double* displays five other petals within the outer ones; it is pictured full blown. The badge of the House of York is a white rose, while that of the House of Lancaster, its former rival, was a red rose, and their numerous feudal combats are known in history as the «Wars of the Roses.» The «Tudor» rose is the white rose of York and red rose of Lancaster combined. In old England roses were the popular presents for birthdays, but in classic art a rose figured on a tomb denotes a short life. And with the Romans the graves were strewn with roses, emblematic of death.

Clement W. Coumbe.

**ROSE, Order of the.** See Orders, Royal.

**ROSE-BREASTED GROSBEAK.** See Grosbeak.

**ROSE-CHAFER.** See Grape Insect-pests.

**ROSE FESTIVAL,** a peculiar kind of festival which is celebrated annually on 8 June in some French villages. A similar gala-day is celebrated in Los Angeles, Cal., annually in June.

**ROSE OF JERICHO,** or **RESURRECTION PLANT,** a small, annual, cruciferous plant (*Anastatica hierochuntica*) which grows in the desert regions about the Red Sea. It bears minute white flowers succeeded by tiny pods, containing a few seeds. When the seeds are ripe the leaves fall off, the branches curl inward and interlace, enclosing the pods still holding their seeds, and become dry and rigid, causing the plant to assume the form of a ball, ready to be blown hither and thither by the winds of the dry season. When the plant is deposited in a damp place, it exercises its remarkable hygroscopic powers, rapidly uncoils and lets the seed escape in soil suitable for germination. This habit of curling up when dry, and rapid absorption of water, forcing the apparently dead limbs to spread open, as if alive again, has caused the plant to be collected and sold as a curiosity.

**ROSE OF LIMA, Saint,** a religious woman of Spanish America: b. Lima, Peru, 20 April 1586; d. there, 30 Aug. 1617. Her baptismal name was Isabel, but from her fine complexion she was given the name of Rose. She early showed herself resolute in avoiding the self-indulgence of society and the world. As a symbol of the life she had chosen she planted her garden only with bitter herbs and interspersed them with figures of the cross. In her religious exercises she took the great mystic, Catharine of Siena, as her model. When her parents fell into poverty she was taken into the family of the treasurer Gonsalvo, by the devout wife of that gentleman, and by her labor day and night supplied the necessities of her parents. When she was importuned by her friends to marry, she refused, and as her duty to her parents forbade her taking the veil, she emphasized her refusal by joining the Third Order of Saint Dominick, and the religious strictness and exalted piety of her life was an example which won the admiration, sometimes the imitation, of the worldly and profane. On her death the chapter of the cathedral, the senate and all the most honorable companies of the city took turns in carrying her body to the grave. She was canonized by Clement X in 1671, and 30 August was appointed for her festival.

**ROSE OF LIPPE, The.** See Orders, Royal.

**ROSE-MALLOW.** See Hibiscus.

**ROSE-NOBLE,** an English gold coin current in the 15th and 16th centuries, and of varying value. It was so called because it was of the same value as the noble, a money of account, and was stamped on one side with the figure of a rose. It ceased to be coined in the reign of Henry V.

**ROSE POLYTECHNIC INSTITUTE,** an institution of collegiate grade at Terre Haute, Ind. Its organization was begun as early as 1874, but it was not opened to students until 1883. It is governed by a board of nine members, of whom one is an alumnus elected by the alumni. The institute offers four courses, each of four years' duration. They are in mechanical engineering, electrical engineering, civil engineering and architecture, and chemistry. From the first the practical work in the institute shops has been an important feature of the curriculum. The degree of bachelor of science is conferred for the completion of any of these courses; that of master of science, two years after graduation if one year is spent in graduate study; the degrees of mechanical engineer, electrical engineer or civil engineer are conferred upon those who have the master's degree after two years' successful professional work. The grounds and buildings of the institute are valued at $145,000; the library contains 16,000 volumes. The original endowment from the founder, Chauncey Rose, was over $500,000, and additions to this fund have since been made. The students number about 240, and the faculty 20.

**ROSE OF SHARON,** a name given to an ornamental malvaceous shrub, the *Hibiscus syriacus*. The rose of Sharon of the Bible was doubtless a bulbous plant, probably a kind of narcissus. See Hibiscus.

**ROSE WINDOW,** a circular window, especially one divided into compartments by mullions and tracery radiating from the centre, also called Catharine wheel and marigold window according to modifications of the design. It forms a fine feature in the church architecture of the 13th and 14th centuries, and is mostly employed in the triangular spaces of gables. In France it is much used, and, notwithstanding difficulties of construction, attained great size. Notable examples are found in the windows in the cathedrals of Amiens, Chartres, Paris, and in that of Rheims Cathedral which was over 40 feet in diameter. See Ecclesiastical Art.

**ROSE-WOOD,** the commercial name for chestnut-colored, dark-veined woods, brought chiefly from Brazil, of varying origin, but mainly the product of *Dalbergia nigra,* one of the *Luguminosæ* or *Fabaceæ.* It is imported not in logs or planks, since the large heartwood rots easily, but in segments, and is sold by weight, being valued according to its richness of color. When cut it gives out a faint rose-odor, and is fine and hard, takes a high polish and is much in demand for cabinet making and pianos, being used solidly and in veneer, although somewhat difficult to work on account of its resinous veinings.

**ROSEATE SPOONBILL.** See Spoonbill.

**ROSEATE TERN.** See Tern.

**ROSEBERY,** rōz'bėr-ĭ, **Archibald Philip Primrose,** 5th Earl of, English statesman and author: b. London, 7 May 1847. He was educated at Eton and Oxford; became Earl of Rosebery in 1868; as a member of the House of Lords entered his political career without the advantage of a training in the Commons, but soon proved himself a brilliant debater; in 1872 was a commissioner on Scottish endowments, and was successively rector of the great Scottish universities of Aberdeen (1878–81) and Edinburgh (1882–83). In 1878 he married Hannah, only daughter of Baron Meyer de Rothschild. From August 1881 to June 1883 he was Under-Secretary of State for the Home Department, in 1884 became First Commissioner of Works and in 1886 was appointed Secretary of State for Foreign Affairs in Gladstone's Home Rule government. He was generally approved for his skilful treatment of the difficult questions connected with the war between Bulgaria and Serbia and the coercion by the European concert of Greece, then threatening war with Turkey. With the defeat of the Home Rule bill and of the government at the general election he passed from office. He soon, however, entered upon a new activity and one with which up to his time peers had been supposed to have nothing to do, namely, the municipal government of London. Upon the organization of the London County Council, a representative body chosen by popular suffrage and responsible to the public, he at once enlisted himself in the service of the improved system of government promised thereby, on 17 Jan. 1888 became a member of the council and on 12 February was made its chairman. In June 1890 he resigned. Following his example many others of rank and prominence entered the council, whose work was raised to an important position in English public life. For some months in 1892 he was again president of the council. Upon Gladstone's accession to power in that year he once more became Secretary for Foreign Affairs. He maintained continuity in foreign policy; strongly advocated some kind of imperial federation; made in September 1894 a notable and characteristic speech before the Lords on the Home Rule bill, which, though passed by the Commons, was thrown out by the Upper House after a four-days' discussion; and brought to a satisfactory end the serious coal strike of 1893. When Gladstone retired from political life in 1894 Rosebery was summoned to form an administration, notwithstanding that there were other Liberals whose length of service was thought by many to give them precedence. Many influential Liberals objected, too, it was said, to a Prime Minister without the House of Commons. No remarkable events attended his administration. The Liberal majority was not large; and before long there were evidences of an increasing division within the party, due in large measure to opposition to his imperialistic views. His government was once or twice discomfited, and finally on 21 Jan. 1895 was defeated in the committee on army estimates. He resigned on 22 January and became the leader of the Liberal opposition. In October 1896 he resigned this position, and since that time has continued, to use his own phrase, to «plough his lonely furrow.» In May 1898 he spoke on Gladstone before the House of Lords; in 1899 was elected lord rector and in 1908 chancellor of Glasgow University. In his later years he advocated the elimination of Home Rule from the Liberal program, and opposed Chamberlain's tariff reform scheme. He is distinguished for his many and varied attainments, and as a ceremonial and commemorative orator is unequaled in England. Marked characteristics of his speeches are their literary quality, derived from a very extensive reading, and that skilful irony whose presence he has so admiringly indicated in the writings of Stevenson. As an author he is known for his 'Life of William Pitt' (1891), already becoming a sort of classic; a 'Life of Sir Robert Peel' (1899), and 'Napoleon: The Last Phase' (1900), a most careful and interesting narrative of the captivity at Saint Helena, with a severe arraignment of English blunders in the treatment of the emperor; 'Lord Randolph Churchill' (1906), and 'Chatham: His Early Life and Connections' (1910). Consult the 'Life and Speeches' (1900) by Coates, a eulogy throughout; also the collection, 'Appreciations and Addresses' (1899). See Great Britain — History of the 19th Century.

**ROSEBRUGH,** rōz'brŭ, **Abner Mulholland,** Canadian physician and inventor: b. near Galt, Ontario, 8 Nov. 1835; d. 1914. He was educated at Victoria College, Toronto, and later studied in New York and London. He engaged in practice at Toronto, revived the Free Dispensary there in 1863, and in 1867 organized the Toronto Eye and Ear Infirmary. He specialized in medical electricity and in opthalmology. In 1864 he invented a new demonstrating opthalmoscope, and in 1865 he succeeded in photographing the inverted retinal image of an object placed in front of the eye. He perfected in 1883 a practical method of duplex transmission of telegraphic and telephonic communication, and improved the method in 1890. Author of 'An Introduction to the Study of the Optical Defects of the Eye' (1866); 'Chloroform and a New Way of Administering It' (1869); 'Handbook of Medical Electricity' (1885), etc.

**ROSEBURG,** rōz'bėrg, Ore., city, county-seat of Douglas County, on the Umpqua River, and on the Southern Pacific Railroad, about 200 miles south of Portland. It is the commercial and trade centre for the fertile valley of the Umpqua, in which farming, fruit-growing, stock-raising and mining are carried on.

The chief manufactures are flour, dairy products, canned fruits, wagons and carriages. It has the Oregon State Sodiers' Home. Pop. 4,738.

**ROSECRANS**, rō'zē-kränz, **William Starke**, American soldier: b. Kingston, Ohio, 6 Sept. 1819; d. near Redondo, Cal., 11 March 1898. He was graduated at West Point, entering the army as 2d lieutenant of engineers in 1842, but in 1844 returned to West Point as assistant professor of engineering. From 1847 to 1854 he superintended the repair of various harbors on the eastern coast, but resigned his commission in the last-named year and retired to private life in Cincinnati, where he became a consulting engineer and architect. He entered upon his career in the Civil War in the volunteer army, his first service being the organization of the Ohio troops. From colonel of the 23d Ohio Volunteers he was promoted brigadier-general, United States Volunteers, in May 1861, and 23 June was placed in command of three brigades under McClellan in the campaign of western Virginia, where he was victor in the battles of Rich Mountain and Carnifax Ferry. He served in the Department of Western Virginia until he succeeded General Pope in command of the Army of the Mississippi. After successfully defending Corinth in western Tennessee during the siege of 11 June 1862, he was put in command of that district by General Grant, with headquarters at Jackson, Tenn. His memorable career as commander of the Army of the Cumberland began in October 1862, and in June 1863 he moved upon the Confederate army under General Bragg, whose forces he had been holding in intrenchment during the Northern victory at Vicksburg, causing Bragg's retreat over the Cumberland Mountains to Chattanooga. In the battle of Chickamauga, 19–20 Sept. 1863, Rosecrans was badly defeated. He was soon after transferred to the Department of the Missouri, and in 1864 relieved of his command. He retired to Cincinnati, where he remained until 1868, when he was appointed Minister to Mexico. In 1865 he was brevetted major-general in the United States army. In 1881–85 he represented California in Congress. From 1885 to 1893 he was Register of the United States Treasury and his beautiful signature is to be seen on the treasury notes of that period. He was restored to the rank of brigadier-general and placed on the retired list of army officers in 1898. Consult Bickhork, ‹Rosecrans' Campaign with 14th Army Corps› (1863); Cast, ‹The Army of the Cumberland› (1875); Fiske, ‹The Mississippi Valley in the Civil War› (1900).

**ROSEDALE**, Kan., city in Wyandotte County, near Kansas River, adjoining Kansas City, Kan., on the north and Kansas City, Mo., on the east, and on the Saint Louis and San Francisco Railroad. The city virtually forms a part of Kansas City. There are iron and wire works. Pop. (1920) 7,674.

**ROSEFISH**, a large red fish (*Sebastes marinus*) of the rockfish family (*Scorpænidæ*), taken numerously on far northern coasts, where it frequents shallow shore-waters, while southward it remains at considerable depths. It bites readily to hand or trawl lines, its flesh is good, and it is profitable for market as it reaches a length of two feet. Its color is orange-red. Many local names belong to it, as red perch, snapper, Norway haddock, hemdurgan, etc. The rosefish feeds upon crustaceans, small fish and mollusks; and the young at least are among the most important food-resources of cod and halibut.

**ROSEGGER, Peter**, Austrian novelist and short-story writer: b. Alpl, Styria, 31 July 1843; d. 28 June 1918. The son of a poor peasant, he was obliged to obtain an education by his own efforts, chiefly out of school, until he gained the literary protection of Albert Swoboda, editor of the Graz *Tagespost*, to which Rosegger became a contributor. He obtained a traveling stipend, with the aid of which he visited Germany, Holland, Switzerland and Italy, and in 1876 founded, at Graz, the *Heimgarten*, a periodical with which he continued to be connected until his death. His stories deal with the life of the mountain peasantry of Styria and possess a great deal of rude energy and simple pathos and humor, not always without sentimentality. The most famous is ‹Die Schriften des Waldschulmeisters,› purporting to be the autobiographical record of a recluse country schoolmaster, Andreas Erdmann, who chooses this profession after an adventurous youth, but, after having practised it for 50 years, again feels a longing for the more exciting life of great multitudes. Other important works are ‹Das Buch der Novellen› (1872–86); ‹Waldheimat› (autobiographical, 1873, 1877; 35th ed., 1912); ‹Der Gottsucher› (1883); ‹Jakob der Letzte› (1888); ‹Peter Mayr› (1893). Two good editions of his works are ‹Ausgewählte Schriften› (30 vols., Vienna 1894) and ‹Volksausgabe› or People's edition (40 vols., Vienna and Leipzig 1895–1900). There are biographies by Vulliod (in French) and by Feierfeil (in German).

**ROSELLE**, N. J., borough in Union County, three miles southwest of Elizabeth, on the Central of New Jersey and the Lehigh Valley railroads. It has iron works and manufacories of hydraulic machinery. Pop. 5,737. It is adjoined on the west by Roselle Park, a separate borough of residential character. Pop. 5,348.

**ROSELLINI**, rōz'el-lē'nē, **Ippolito**, Italian Egyptologist: b. Pisa, 13 Aug. 1800; d. 4 June 1843. He was educated at Bologna under Mezzofanti, and in 1824 was called to the chair of Oriental languages at the University of Pisa. He shortly afterward became interested in Egyptology, and was associated with J. F. Campollion in study as well as in explorations in Egypt in 1828–29. The death of Campollion left to Rosellini the task of publishing the results of their explorations ‹Monumenti dell egitto e della Nubia› (10 vols., Florence 1832–40). He was also author of ‹Elementa Linguæ Ægyptiacæ› (1837).

**ROSEMARY**, a shrubbery, strongly aromatic plant (*Rosmarinus officinalis*), growing wild in the southern parts of Europe and also cultivated. It belongs to the Mint family (*Menthaceæ*) and has axillary, pale blue flowers with two stamens. The stem is three or four feet high, bearing opposite, linear sessile leaves with revolute margins, which are dark-green, smooth, and shining above, white and cottony beneath. Rosemary is tonic and slightly stimulant, and formerly enjoyed considerable repute as a medicine. It yields, by distillation, a light pale essential oil of great fragrance, which is used in hair pomades. The herb is also used for seasoning in Italy. Rosemary is often referred to in folk-lore: it was supposed to restore youth when eaten; it was woven into brides' wreaths, and otherwise employed at weddings, and was carried to funerals and thrown on the graves, because, as it did not soon fade, it was a symbol of remembrance. «There's rosemary, that's for remembrance.»

**ROSEN, Charles,** American artist: b. Westmoreland County, Pa., 28 April 1878. He studied at the National Academy of Design and at the New York School of Art, and has specialized in landscape painting. He received the Hallgarten Prize for his ‹Rocky Ledge› (1912); was awarded the silver medal at the San Francisco Exposition in 1915; and the Inness gold medal and Altman first prize in 1916. He became an associate of the National Academy in 1913, and member in 1917. His work is represented in the permanent collection of Delgado Museum, New Orleans; and by ‹Washed out Bottom Lands› (Minneapolis Society of Fine Arts); ‹Late Sunlight› (Duluth Art Association).

**ROSEN, Friedrich August,** German Sanskrit scholar: b. Hanover, 2 Sept. 1805; d. London, England, 12 Sept. 1837. He studied at Göttingen and Leipzig, and under Bopp at Berlin, and Silvestre de Sacy at Paris. He occupied the chair of Oriental languages at the University of London in 1828–30, then resigning in order to devote himself to the study of Sanskrit, although he returned to the University as professor of Sanskrit shortly before his death. Overstudy and overwork in earning a subsistence shortened his life. He was author of ‹Corporis radicum Sanscritarum prolusio› (1826); ‹Radices Sanscritæ› (1827); ‹Rig-Vedæ Specimen› (1830); ‹Algebra of Mohammed ben Musa› (1831). He edited Haughton's ‹Bengali and Sanskrit Dictionary›; Colebrooke, H. T., ‹Miscellaneous Essays,› etc. He was engaged in preparing a text and Latin translation of ‹Rig-veda› at the time of his death. The first volume was published posthumously as ‹Rigveda Sanhita, Liber-Primus Sanscrite et Latine› (Oriental Translation Fund, 1838).

**ROSEN, Roman Romanovitch,** BARON, Russian diplomat: b. 1849; d. 31 Dec. 1921. He was educated at Dorpat, and at the Imperial Academy of Law at Saint Petersburg; received an appointment in the Department of Justice and was soon transferred to the Department of Foreign Affairs. He was vice-consul at Yokohoma, and later secretary of the Legation at Tokio; and became Russian consul-general at San Francisco. He was chargé d'affaires at Washington during the period in 1886–89 when there was no Russian Ambassador at Washington. Subsequently he was Minister to Mexico, Serbia, Bavaria and Greece; and at the outbreak of the Russo-Japanese War he was Minister to Japan. He was one of the Russian plenipotentiaries at Portsmouth during the Peace Conference; and in 1905–11 he was Ambassador to the United States. He revisited the United States in 1919.

**ROSENAU,** rō'zē-now, **Milton Joseph,** American physician and sanitarian: b. Philadelphia, Pa., 1 Jan. 1869. He was graduated M.D. at the University of Pennsylvania in 1889, and later studied at Berlin, Vienna and Paris. He was surgeon of the United States Public Health and Marine Hospital Service in 1890–1909. Since 1909 he has been professor of preventive medicine and hygiene at the Harvard Medical School; and also director of the School for Health Officers of Harvard University and the Massachusetts Institute of Technology since 1913, and director of the Anti-toxin and Vaccine Laboratory since 1914. He was appointed surgeon with rank of lieutenant commander in the United States Naval Reserve Force in 1917. He was awarded the Georgetown University gold medal of American medicine for service to humanity in 1913–14. Author of ‹Viability of the Bacillus Pests› (1901); ‹Course in Pathology and Bacteriology› (1902); ‹The Immunity Unit for Diphtheria Anti-toxin› (1905); ‹The Standardization of Tetanus Anti-toxin› (1908); ‹Preventive Medicine and Hygiene› (1913; 3d ed., 1917), etc.

**ROSENAU, William,** American rabbi and educator: b. Wollstein, Germany. After coming to America he studied in the public schools of Philadelphia and Cincinnati and was graduated from the Hebrew Union College in Cincinnati in 1889. He was rabbi in Omaha, Neb., 1889–92, and has been rabbi in Baltimore since 1892. He has been instructor and is now associate in rabbinica at Johns Hopkins University, and among his publications are ‹Semitic Studies in American Colleges›; ‹Hebraism in the Authorized Version of the Bible›; ‹Jewish Ceremonial Institutions and Customs.›

**ROSENDALE,** rō'zĕn-dāl, **N. Y.,** village in Ulster County, on the Rondout River, the Delaware and Hudson Canal, and the Walkill Valley Railroad, about eight miles south by west of Kingston (q.v.). It is noted for its manufacture of hydraulic cement (q.v.). Most of the cement derived from the natural cement rock in the United States comes from Rosendale. Pop. 1,125.

**ROSENTHAL,** rō'zĕn-täl, **Max,** American artist: b. Turck, then in Russian Poland, 23 Nov. 1833; d. August 1918. At 14 he studied art in Paris, and coming to Philadelphia in 1849, he entered the Academy of Fine Arts, chromo-lithography being his specialty. In 1861 he followed the Army of the Potomac and executed drawings of every camp until Gettysburg. Some of his best work is seen in illustrated plates of the report of the United States Military Commission to the Crimea (1860) and in Dickinson's ‹Numismatics of the United States.› In 1880 he started etching and made all of the Continental Congress, officers that fought in the American Revolution, the British officers, Attorneys-General and in 1891 illustrated the ‹History of the Supreme Court of the United States,› by Hampton L. Carson, also began Mezzotinting in 1891. In 1906 he painted a large picture of ‹Jesus at Prayer› and at the same time made quite a few miniatures. More than 500 of his historic portraits are in the Smithsonian Institution.

**ROSENTHAL, Toby Edward,** American painter: b. New Haven, Conn., 15 March 1848;

reported deceased c. 28 Dec. 1917. He studied at Munich in the studio of K. Raupp (q.v.) and in 1868 came under the instruction of Piloty. After producing many genre pictures he attracted attention by his ‹Sebastian Bach and his Family at their Morning Devotions› (1870), which was purchased by the Leipzig Museum. After a visit to his home in the United States he returned to Munich and painted ‹Elaine the Fair› (1874) from Tennyson's idyll of ‹Elaine.› He also produced some humorous pictures, such as ‹He Laughs Best Who Laughs Last› (two panels) and ‹The Girls' Boarding School in Alarm› (1877). His name will be perhaps best remembered for his ‹Trial of the Escaped Nun, Constance de Beverley› (from Sir Walter Scott's ‹Marmion›), and ‹A Dancing Lesson of Our Grandmothers.› Two other paintings of this artist have become universally popular; these are ‹The Portrait of the Cardinal› and the dramatic painting ‹The Vacant Chair› (both in private galleries in America). Among the more prominent works of his later period are ‹The Christ Carver› and ‹His Madonna.› Mr. Rosenthal was honored by a number of medals of first and second class and received the cross of the Knights of Saint Michael.

**ROSENWALD, Julius,** American merchant and philanthropist: b. Springfield, Ill., 12 Aug. 1862. He was of Jewish descent and early engaged in the mercantile business. He was vice-president and treasurer of the Chicago mail-order house, Sears, Roebuck and Company, in 1895–1910, and has since been president of the company. He was appointed to the advisory committee of the Council of National Defense and chairman of the Commission on Supplies in 1916. He is a generous benefactor of educational institutions, particularly the Young Men's Christian Association for colored people, rural schools and the Chicago Universtiy. He was also a foremost organizer of the Jewish War Relief.

**ROSEOLA,** any rose-colored rash occurring usually in a symptomatic character, with some febrile disorder, as measles, scarlet fever, etc., or with gastric disturbances. The term is often applied, though inexactly, to German measles and to mild forms of other diseases attended with a rash of similar appearance to that seen in roseola.

**ROSES,** flowers of the type-genus *Rosa*, of the order *Rosaceæ*. The species are exceedingly variable; probably no other genus calling forth so wide a range of botanical opinion. Most botanists recognize about 100 species; Bentham and Hooker estimate the number at less than 40, but Gandoger describes more than 4,000 as indigenous to Europe and western Asia. The number of horticultural varieties, crosses and hybrids is probably several times larger than in any other genus; more than 3,000 varieties are listed in French catalogues, and since new ones are added annually the list consists of active members. The roses are widely distributed in the temperate and cold parts of the northern hemisphere extending in the respective continents southward to India, Abyssinia and northern Mexico. They are erect, climbing or trailing shrubs, generally prickly-stemmed; bear alternate, odd-pinnate, though sometimes simple, leaves and generally large, showy, pink, white, yellow or purple flowers born either singly or in terminal corymbs, followed by generally showy berry-like fruits (hips) which contain several bony akenes. Probably no flower has played so important a rôle in the garden and in literature. It was prized in the cradle days of the Aryan race and is frequently mentioned in the writings prior to our era. China and Japan, however, seem to have been less attracted to it than more western races. In very early times the flowers exhibited their characteristic tendency to double; indeed, it is probably the first flower cultivated in this state, and is now more often thought of in this form perhaps than in its natural single form. The single roses are, however, useful and popular in park planting.

Except for ornamental purposes roses are of small importance; the only uses made of them are the preserving of the fruits of a few species for food and the manufacture of perfumes, especially attar or otto of roses and rose water from the flowers of some other kinds, principally *R. alba* and *R. damascena*, which are extensively grown in southeastern Europe, particularly Bulgaria and adjacent Asia and in southern France, in which last country the leading rose is the Provence, a hybrid variety of *R. centifolia*. The flowers are either put in stills or are macerated. In the distilling process the essential oil is extracted by steam and condensed. In each process there is considerable perfume in the water used and in the maceration process, which is most popular in France, this «rose water» is the product sought rather than the attar which is regarded as a by-product. These perfumes are among the most important of the world, and it is said that the importations of the attar alone into the United States is greater than the importations of any citrus perfume such as lemon oil, oil of bergamot, etc.

Unquestionably the roses are the most important flowers cultivated. They are prized by everyone who cares for flowers at all, and throughout the civilized world are probably grown in more gardens than any other flowers. (How important they are commercially appears by the statistics quoted in the article FLORICULTURE). In the United States alone the number of blossoms annually grown for sale has been estimated at 100,000,000, valued at about $6,000,000. Yet the development of this industry, which now demands the greatest skill of specialists, has sprung from insignificance in 1870; and in 1850 it did not exist.

From the botanist's standpoint the classification of Crépin in his ‹Primitiæ Monographiæ Rosarum,› seems to be one of the most satisfactory and is followed by botanists perhaps more frequently than any other; from the gardener's standpoint Barron in the ‹Cyclopedia of American Horticulture,› divides the roses into 19 groups with more or less subdivision. Among these the following are probably the most important. *Provence*, perhaps most familiar in America in one of its types, the fragrant globular flowered moss roses; *Damask* and *French*, fragrant-flowered, robust growing, hardy prolific roses; *Ayrshire*, very hardy climbing roses with solitary fragrant white to deep crimson flowers; *Briers*, small perishable-flowered garden roses more useful in shrubberies than for cut flowers; *Multiflora*, with large corymbs of rather short-lived flow-

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ers, and popularly known as ramblers, used largely in wild gardens, though the crimson rambler and its sub-varieties which belong to the polyantha subdivision are used for porch decoration for which they are admirably adapted; *Evergreen*, the foliage continuing very late in autumn; for example, *R. Wichuraiana*, a very popular hardy trailer which grows anywhere; *Hybrid perpetual*, upright growing, though sometimes pendulous, shrubs which bear flowers of all types and colors and embrace the largest number of varieties of any group but so greatly mixed as to preclude separation and definition; *Hybrid teas*, a group of the preceding, the members being the result of crosses with the Chinese tea-scented rose, especially rich in forcing varieties; *China* or *monthly rose*, a perpetual-blooming rose chiefly interesting because of its effect upon other roses by hybridizing through its variety the tea rose; *Musk*, very fragrant light-colored rather tender roses best known in their derivatives, and noisettes, which blossom later, are hardier than the type, and will grow in any soil but are little used probably because the blending with the teas seems to have impaired their hardiness; *Polyantha*, perpetual-flowering multiflora climbing varieties bearing small flowers in clusters and especially promising as the parents of a nebulous group of varieties adapted to American requirements; *Perpetual briers*, best known in America by one of its component species *R. rugosa*, a hardy Japanese rose much used in exposed situations for hedges, screens, etc., and useful for hybridizing with many other species.

Rose species are propagated by seeds which are either sown as soon as the hips are ripe or are stratified in sand until spring. If allowed to become dry they may require two years to germinate, but if treated as above they generally sprout the first spring. Many species may be propagated by means of cuttings of nearly mature wood taken during summer and rooted under glass. Others will grow from mature wood cuttings taken in autumn and rooted in the spring like currants and gooseberries. Layering is generally practised with such species as do not root readily from cuttings; for example, *R. hemisphærica* and *R. eglanteria.* Some species such as the cinnamon rose (*R. cinnamomea*), the Carolina rose (*R. carolina*) and the Damask rose (*R. damascena*), may be propagated by suckers, division or by cuttings of the roots which in the last case should be dug in autumn, stored in sand or sphagnum in a frost-proof cellar until spring when they are planted in nursery rows. Grafting and budding are also practised, but are frequently unsatisfactory where regular intelligent attention cannot be given to the removal of the suckers that generally spring from the stock. For greenhouses and for forcing, cuttings of semi-mature wood are nearly universally used. They may be taken at any time, rooted with bottom heat in sand, and kept in pots until large enough to be transplanted upon the branches.

In general, roses thrive best upon loamy soils, rich in plant food and humus, well drained but moist, in situations sheltered from the wind but where they will receive the sunlight at least half the day. They do not generally succeed upon very loose or sandy soils, but often do upon heavy clays. They are seldom difficult to transplant with ordinary care, are easy to cultivate and generally simple to prune. The removal of weak and old wood is the most important pruning detail. But care must be taken especially with climbing varieties to preserve the long sturdy shoots, since they are most prolific of blossoms. Indoor roses cultivated for cut flowers are generally pruned so as to have the flowers borne singly at the ends of long stems sometimes, as in the case of American Beauty, exceeding four feet in length. But this is a special florist's practice and is dependent not only upon the method of pruning but upon the management of the plants otherwise. In the garden the plants may usually be set about 30 inches apart in beds about four feet wide, the plants of one row being preferably opposite the intervals of the other so as to obtain full light and air. Beds of this width need not be tramped on when the flowers are being gathered. Cultivation consists in keeping the surface loose and open at all times by raking, a rather shallow forking being given each spring. In the autumn a liberal mulch of stable manure should be spread upon the beds and the coarser parts removed in the spring before the annual forking. The removal of all dead, failing or puny shoots should precede the cultural operations. Many gardeners give applications of liquid manure just as the flower buds appear and preferably preceding a shower. When well managed a rose bed should be satisfactory for 10 or more years.

A large number of insects feed upon the rose both out of doors and in the greenhouse. Of those which sometimes prove troublesome in the garden the rose beetle or chafer is perhaps the most annoying, since it feeds upon the petals of the opening flowers, thus ruining them. The only remedy which has been satisfactorily applied is hand picking. Plant lice (see APHIS) and scale insects (q.v.) are often found upon roses, but in the garden are not usually very troublesome. Slugs occasionally skeletonize the leaves by working upon the undersides, and several caterpillars, beetles, etc., also live upon the foliage, usually, however, in insufficient numbers to do damage. In the greenhouse some of the above species may appear, but they are usually debarred by correct methods of management, especially as to ventilation, temperature and humidity. The red spider, not an insect but a mite, is sometimes troublesome where the air is allowed to become too dry. Management will also prevent the so-called plant diseases occasionally found in poorly ventilated houses; indeed, attention to the details mentioned is in many leading houses found more expedient and satisfactory than recourse to the so-called remedies for either insects or maladies.

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T. W., ‹Roses and Their Cultivation› (London 1914); Joret, C., ‹La Rose› (Paris 1892).

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**ROSES, Wars of the**, the name given to the protracted struggle between the houses of Lancaster and York for possession of the English throne, in the second half of the 15th century. The appellation was derived from the badges adopted by the contending parties, a white rose by York and a red rose by Lancaster. The outbreak of the war was brought about by the growing discontent of the people with the evil fortunes of the war against France and the oppressive taxes necessitated by the heavy military expenditures. The imbecile Henry VI (q.v.) had shown himself quite incapable of the tasks of government and this served to enhance the power of Richard, Duke of York, the representative of the claims of the house which had been driven from the throne in 1399 in the person of Richard II, Henry IV assuming the crown by parliamentary sanction, and being succeeded by Henry V. The Duke of York's strongest opponent was Margaret, wife of Henry VI, a woman of great strength of character and much ability. The first battle of the war was fought in 1455 at Saint Albans and resulted in a victory for the Yorkists, whose head became, for the second time, protector of the realm. War broke out again in 1459 and began auspiciously for the Lancastrians. The Duke of York and the Earl of Warwick and Salisbury were compelled to flee the country. In June 1460 they returned, however, and defeated the Lancastrian forces at Northampton and took Henry VI prisoner. A compromise was effected by which Henry VI was to retain the crown until his death, when it was to pass to the Duke of York. Queen Margaret, however, would not consent to this wrong to her son, and continued the struggle. At Wakefield, 30 Dec. 1460, the Yorkists were defeated and the Duke of York was killed, and soon after the Lancastrians gained a second victory at Saint Albans (17 Feb. 1461). Edward, Earl of March, the Duke of York's eldest son, joining forces with Warwick, succeeded in getting possession of London, which was a fervent supporter of the Yorkist cause, and was elected king, setting out immediately to meet the enemy, on whom he inflicted a bloody defeat at Towton (29 March 1461). Henry VI fled to Scotland and the remnants of Lancastrian resistance were crushed out at Hedgley Moor and Hexham in 1464. A quarrel between Edward IV and the Earl of Warwick led the latter to embrace the Lancastrian cause. Returning from France with a large force in 1470, he compelled Edward to seek refuge in Holland. Henry VI was released from captivity and replaced upon the throne. Edward IV, however, returned to England in the early part of 1471, and on 14 April decisively defeated Warwick at Barnet, the «king-maker» himself falling in the fight. On 4 May a Lancastrian force under Queen Margaret was overthrown at Tewkesbury and the young Prince Edward met his death there, most probably by assassination after the battle. Henry VI died in the Tower a few days later, and Edward IV was securely established on the throne. The last battle in the long conflict was fought in 1485 when Henry of Richmond, representative of the Lancastrian claims, overthrew Richard III (q.v.) at Bosworth Field and ascended the throne as Henry VII. By his marriage to Elizabeth, the daughter of Edward IV, he united in himself the claims of the rival houses. (See England, *Civil History*). Consult Gairdner, ‹Lancaster and York› (1886); Onan, ‹History of England from Richard II to the Death of Henry IV› (1906).

**ROSETTA**, rō-zĕt′tạ (Ar. Reshid), Egypt, a city near the mouth of the Rosetta Canal — a branch of the Nile — formerly the medium of communication between Cairo and Alexandria, which gave to Rosetta a commercial importance which it has lost by the opening up of other channels of traffic. Between 1798 and 1807 Rosetta was captured in turn by the French, English and Turks. Pop. 17,000.

**ROSETTA STONE**, a slab of black basalt of ancient Egypt, now in the British Museum, chiefly noted as having furnished the key for the decipherment of the Egyptian hieroglyphics. The stone was discovered in 1799, during the excavation of Fort Saint Julien, near Rosetta, Egypt, by M. Boussard, an officer of engineers in the French army of occupation. Three years later the stone was brought to England and deposited in the Museum. The stone was erected in 195 B.C. by the priests of Egypt in honor of Ptolemy Epiphanes and in commemoration of his remission of the dues of the sacerdotal body. It bears an inscription duplicated in three languages, in Greek, in hieroglyphics, or sacred, in demotic or common characters, and this fact enabled Dr. Thomas Young in 1818 and later, M. Champollion, in 1822, to decipher it in the three languages and thus furnish a key for the reading of the hieroglyphics (q.v.). The Rosetta Stone is three and one-half feet long, two and one-half feet wide and nearly a foot thick. See Archæology; Hieroglyphics.

**ROSETTA WOOD**, an East Indian wood, of unknown origin, reddish orange in color, with darker veinings. The wood is close, hard and very beautiful when first cut, but soon becomes darker by exposure. It is used in fine cabinet work, and is imported in logs.

**ROSEVILLE**, Cal., city in Placer County, 18 miles northeast of Sacramento, on the Southern Pacific Railroad. It is a growing city with machine shops and yards of the Southern Pacific Railroad, an ice-plant and fruit-packing industry. Pop. (1920) 4,477.

**ROSEWATER, Andrew**, American civil and sanitary engineer: b. Bohemia, 31 Oct. 1848. After a course of study in the common and high schools of Cleveland, Ohio, he became flagman in the engineer corps of the Union Pacific Railroad, engaging in explorations and surveys in 1864 and later in other engineering positions on the same road. He was assistant city engineer of Omaha, Neb., 1868–70 and city engineer, 1870–75. He was in charge of the construction of the Omaha and Northwestern Railroad 1878–80; was resident engineer of the Omaha Water Works Company 1880–81, and from 1881–87 was city engineer. Between 1887 and '91 he was consulting and designing engineer of sewerage for 25 cities. Since 1897 he has been city engineer of Omaha and president of its board of public works.

**ROSEWATER, Edward,** American journalist: b. Bukovan, Bohemia, 1841; d. Omaha, Neb., 31 Aug. 1906. Coming to America in 1854, he became a telegraph operator and for two years (1861–63) was in the United States military telegraph corps. In 1863 he went to Omaha, Neb., as manager of the Pacific Telegraph. In 1871 he was elected to the Nebraska legislature. In 1871 he founded the *Omaha Bee* and edited it till his death. He was vice-president of the Universal Postal Congress at Washington, 1897, and the original founder of the Omaha Trans-Mississippi Exposition (1898).

**ROSEWATER, Victor,** American journalist: b. Omaha, Neb., 13 Feb. 1871. He was graduated at Columbia University in 1891 and in 1893 engaged in newspaper work on the *Omaha Bee,* of which he became editor in 1906, and editor and publisher in 1917. He lectured on municipal finance at the University of Nebraska in 1894 and at the University of Wisconsin in 1904. He has been active politically and in 1917 was appointed a member of the committee on labor of the Advisory Commission of the Council of National Defense. Author of ‘Special Assessments — A Study in Municipal Finance’ (1898).

**ROSICRUCIANS,** rō-zĭ-kroo'shĭ-ạnz, a real or imaginary secret society, the alleged existence of which became known unexpectedly at the beginning of the 17th century. Early in that century appeared several books concerning the society, which are now generally ascribed to Johann Valentin Andreä, a Lutheran clergyman, and among which is the ‘Fama Fraternitatis R.C.’ (1614). This work is the story of a certain holy and reverned Brother Christian Rosenkreuz, a German noble of the 14th century, who, inspired with the lofty ambition of reforming the world, spent a large portion of his days among the Brahmans, and in Jerusalem, Damascus, Egypt, Morocco, Fez, etc., in the pursuit of wisdom. Returning to Germany, he founded an order, consisting of but few members. They met in a house erected by himself, and called Sancti Spiritus Dominus, where he died at the age of 106. His burial-place was to be kept a secret by all the adepts, but he ordered the words «Post CXX annos patebo» to be inscribed upon one of the doors of the house of the order. To this work was added another, ‘Confession of the Society and Brotherhood of the Rosy Cross.’ addressed to the learned of Europe. This tract declared that the order had no intention of interfering with the religious or political action of states, but only desired the improvement of mankind by the discovery of the true philosophy. Whether such a society ever existed is still an open question. Many will have us believe that the above treatises were meant by Andreä to satirize in serio-comic style the philosophical follies of the age, having no expectation that they would be regarded otherwise than as fiction. The fraternity had fallen out of public attention for a long time, when in the latter half of the 18th century the interest in their organization was revived, especially by the noted imposter Cagliostro, who gave out that he was a Rosicrucian. Consult Semler, ‘History of the Rosicrucians’ (1768); Waite, ‘Real History of the Rosicrucians’ (1887).

**ROSIN,** or **RESIN,** the name given to the rosin of coniferous trees employed in a solid state for ordinary purposes. It is obtained from turpentine by distillation. In the process the oil of the turpentine comes over and the rosin remains behind. There are several varieties of rosin, varying in color from the palest amber to nearly black, and from translucent to opaque. It differs somewhat according to the turpentine from which it is derived, this being obtained from numerous species of pine and fir. It is used in the manufacture of sealing-wax, varnish, cement, soap, for soldering, etc. Colophony is a name for the common varieties. See NAVAL STORES.

**RÖSLER,** rèz'lėr, **Augustin,** German clergyman and historian: b. Guhrau, Silesia, 6 March 1851. He was educated at Glogan Gymnasium and the universities of Breslau and Freiburg-im-Breisgan, and at Rome. In 1875 he was ordained to the priesthood, in 1876–77 edited *Schlesisches Kirchenblatt* at Breslau, and in the latter year entered the Redemptorist Order. In 1880–82 he was professor of dogmatic theology and church history, and after 1882 of Scripture and Hebrew at the Redemptorist scholasticate, Mantern, Styria. His published works are numerous, including ‘Der katholische Dichter Aurelius Prudentius Clemens’ (1886); ‘Der Fahneneid des christlichen Mannes’ (1888); ‘Der Stall von Bethlehem’ (1890); ‘Der Katholizismush seine Aufgabe und seine Aussichten nach Prof. Dr. Albert Ehrhard’ (1892); ‘Cardinal Johannes Dominici, O.P.’ (1893); ‘Die Frauenfrage vom Standpunkte der Natur, der Geschichte und der Offenbarung’ (1893; 2d ed., 1907); ‘Cardinal Johannes Dominicis Erziehungslehre und die übrigen pädagogischen Leistungen Italiens im 15 Jahrhunder.’ Der Kartäuser Nicolaus Kempf und seine Schrift: ‘Ueber das rechte Ziel und die rechte Ordnung des Unterrichts,’ Vol. VII of ‘Bibliothek der katholischen Pädagogik’ (1894); ‘Der Reichtum der katholischen Kirche’ (1896); ‘Gewissenserforschung über die Anklagen des Professor Dr. Ehrhard’ (1902); ‘Die Uebung der Caritas durch die Frauen und an den Frauen’ (1901; 2d ed., 1903); ‘Fürs Priesterherz’ (1907; 2d ed., 1908); ‘Liebfrauenschule’ (1910; 4th ed., 1912). Dr Rosler was a collaborator in Herder's ‘Kirchenlexikon’ (2d ed.) and ‘Lexikon der Pädagogik’; Buchberger's ‘Kirchliches Handlexikon, and contributor to *Literarische Rundschau, Historisch-politische Blätter,* the ‘Catholic Encyclopedia,’ etc.

**ROSLIN, ROSLYN,** or **ROSSLYN,** Scotland, village in Edinburghshire, seven miles south of Edinburgh, in the valley of the North Esk. Roslin Chapel, famous for its beauty and containing the tombs of the earls of Orkney and Roslyn, is located here; it was built in the 15th century. Pop. 1,129.

**ROSLYN,** N. Y., village in Nassau County, Long Island, on an inlet of Long Island Sound, 18 miles northeast of Brooklyn, and on the Long Island Railroad. It was the home of William Cullen Bryant (q.v.), who, with his wife, is buried there. The village is chiefly residential in character. Pop. (1920) 2,500.

**ROSLYN,** Wash., city in Kittitas County, 70 miles east of Tacoma, on the Northern

Pacific Railroad. It has important commercial interests as the centre of the coal-mining district of the State. Pop. (1920) 2,673.

**ROSMINI,** rōs-mē′nē, **Antonio Rosmini-Serbati,** Italian philosopher: b. Roveredo in the Italian Tyrol, 25 March 1797; d. Stresa, 1 July 1855. He began the course of studies for the priesthood at Padua in 1817, and was ordained in 1821. He became deeply versed in philosophy, ancient and modern, and revolved in his mind a comprehensive system to serve as a basis for the truths of revelation, while on the practical side he planned an institution for the training of teachers and priests. From 1826 to 1828 he lived mostly in Milan, thought out the rule of his new order, visited Rome, gained the approval of Pius VIII both for special studies and for the institution of his order, and published his ‘New Essay on the Origin of Ideas’ (1830).

After a few years of labor at Trent he settled in 1837 at Stresa on the west shore of Lago Maggiore and, surrounded by loving and devoted friends, sent volume after volume to the press. His dream in politics, as expressed in his ‘Constitution according to Social Justice’ (1848), was a confederation of the states of Italy under the Pope as perpetual president. For a brief period he basked in the papal favor, and was promised by Pius X a cardinal's hat; and on the Pope's flight to Gaeta he followed, but now found the pontiff's mind turned against him and never afterward regained his confidence. His ‘Constitution’ and ‘The Five Wounds of Holy Church’ were next prohibited by an irregular meeting of the Congregation of the Index called at Naples. But in 1854 the Congregation of the Index, the Pope presiding, declared Rosmini's writings entirely free from censure and enjoined perpetual silence on all his accusers. The «Institute of the Brethren of Charity» survived its founder, and among the Rosminian Fathers, who are mostly Italians or Englishmen, are to be found at the present day some of the ablest and most devoted sons of the Roman Church. In England it has foundations at Ratcliffe, Loughborough, Cardiff, Wadhurst, Rugby, and established in 1876 its central house at Saint Ethelreda's, Holborn, once the domestic chapel of the palace of the bishops of Ely.

The foundation of Rosmini's philosophy is being considered as the form of the intelligence — an elemental intuition of which is implanted by Nature herself. Intuition gives us ideas, of which we may affirm (1) that they are not nothing; (2) that they are not ourselves; (3) that they have a mode of existence of their own, entirely different from that of real or subsistent things, and independent of the bodily sense. Their two essential characteristics are universality and necessity; for real objects and sensations are always particular, instead of being universal and generic, and every object which involves no contradiction is necessarily possible. These two characteristics involve two others, infinity and eternity; the origin of the ideas comes from God, for man does not receive them from the things themselves. The one indeterminate and wholly universal idea is that of being or existence; we cannot determine the subsistence of an object until we first have the idea of it, therefore perception involves the idea which is further isolated from all the other elements of the perception by the process of universalization through which it may be realized an indefinite number of times. When the ideas are all fully or perfectly determined, they are called concrete; when they remain to a certain extent indeterminate, they are abstract. Being is incorporeal, independent of space, spiritual, and therefore incorruptible and immortal. It is independent of time; as being in its essence is always being, and as it would be a contradiction in terms for being to cease to be being, it is eternal. But since it was united to the soul in time, it must have existed before it and be independent of it. And thus we reach an Intelligence anterior to human intelligence — an Eternal Mind. This eternal mind is God's, and therefore God exists, and his existence and the immortality of the soul remain the true foundation of morals. Consult Tommaseo, ‘Antonio Rosmini’ (1855); Lockhart, ‘Life of Antonio Rosmini’ (1866); Werner, ‘Rosmini und seine Schule’ (1884); and above all, Davidson, Thomas, ‘Philosophical System of Rosmini’ (1882).

**ROSNY, Joseph Henry,** pseudonym of the French novelists, **Joseph Henri Honoré BOËX:** b. Brussels, 1856; and his brother, **Séraphin Justin François BOËX:** b. Brussels, 1859. Henry worked alone as a novelist until 1891, and the brothers then collaborated until 1912, since when they have written independently. Their work is of a strong sociological trend, the theme sometimes taking an anarchistic level, and there is an extensive interweaving of scientific information. The characters are drawn with a striking realism and present individual portraits rather than representative types. Henry was influenced by Zola in his earlier work but the brothers in 1887 were among the writers who formally protested against Zola's ‘La Terre.’ Henry was sole author of ‘Nell Horn, membre de l'armée du salut’ (1886); ‘Le Bilatéral’ (1886); ‘L'Immolation’ (1887); ‘Le Termite’ (1890); ‘Erymah’ (1895), etc. Together the brothers wrote ‘Daniel Valgraive’ (1891); ‘L'Imperieuse Bonte’ (1894); ‘Le Serment’ (1896; dramatized 1897); ‘Les Ames Perdues’ (1899); ‘Therese Degaudy’ (1902); ‘Sous le fardeau’ (1906); ‘Le Testament volé’ (1909); ‘La Mort de la terre’ (1912), etc. Later Henry was author of ‘La guerre du feu’ (1913); ‘La force Mysterieuse’ (1914); ‘Perdus?’ (1916); ‘L'enigme de Givreuse’ (1917), etc. Justin was author of ‘Sépulchres blanchis’ (1913); ‘La Caraface’ (1914), etc.

**ROSNY, Léon Louis Lucien Prunol de** (pseudonyms José Perez and Leone d'Albano), French Orientalist, ethnographer and translator: b. Loos, 5 Aug. 1837. He was educated at the Elève d'Adrien Jessieu and because professor of Japanese at the Bibliothèque Imperiale. He was appointed professor at the École des Langues Orientales in 1868; and became director of the École des Hautes-Etudes at the Sorbonne in 1886. He became an authority on the Chinese, Japanese and Korean languages and on the antiquities of Central America and Yucatan. He edited the *Revue Orientale et Américaine* in 1859–65 and in 1876–79. Author of a Chinese, Japanese and French Dictionary (1864); ‘Grammaire Japonaise’ (1865); ‘Archives Paleographiques’ (1869); ‘Anthologie

Japonaise› (1871); Grammar of the Chinese Language› (1874); ‹L'interpretation des anciens textes Mayas› (1875); ‹Les Coréens, Apercu ethnographique et historique› (1886); ‹First Elements of Chinese Grammar› (1887); ‹L'atlantide historique› (1902); ‹L'Amérique pre-Colombienne› (1904), etc.

**ROSS,** rŏs, **Alexander,** British soldier: b. Scotland, 1742; d. London, 29 Nov. 1827. He entered the British army in 1760, and was made captain in 1775. He served as aide-de-camp to Lord Cornwallis in the war of the American Revolution, and served as his commissioner in arranging for his surrender at Yorktown. He afterward served with Cornwallis in India, and in 1812 attained the rank of general.

**ROSS, Alexander,** Canadian fur trader and author: b. Mairnshire, Scotland, 9 May 1783; d. Manitoba, 23 Oct. 1856. He emigrated to Upper Canada in 1805 where he was for some years a teacher. In 1810 he joined the fur-trading expedition of John Jacob Astor; was one of the founders of Astoria, and established trading posts in the most isolated regions. He wrote the earliest and most graphic accounts of the Columbia and Oregon country, with the opening up of which he was for years identified. In 1814 he joined the Northwest Company and joined in its merger with the Hudson's Bay Company in 1821. He was later prominent in the Red River Colony, and was sheriff of Assiniboia. Among his works are ‹Adventures of the First Settlers on the Oregon and Columbia Rivers› (1849); ‹Fur Hunters of the Far West› (1855), and ‹Red River Settlement: Its Rise, Progress and Present State› (1856).

**ROSS, Alexander Milton,** Canadian naturalist: b. Belleville, Ontario, 13 Dec. 1832; d. Detroit, Mich., 27 Oct. 1897. At 13 he came to New York, where he became a compositor on the *Evening Post* and a protégé of William Cullen Bryant. In 1851 he began to study medicine, and during the Civil War was a surgeon in the Union army, but rendered his greatest service to the cause as confidential correspondent to Lincoln in Canada. His subsequent life was chiefly devoted to the study of natural history, in the pursuit of which he has added valuable information concerning the fauna and flora of Canada. He published ‹Birds of Canada› (1872); ‹Butterflies and Moths of Canada› (1873); ‹Forest Trees of Canada› (1874); ‹Ferns and Wild Flowers of Canada› (1877); ‹Mammals, Reptiles and Fresh Water Fishes of Canada› (1878).

**ROSS, Edward Alsworth,** American sociologist: b. Virden, Ill., 12 Dec. 1866. He was graduated at Coe College, Iowa, in 1886 and later studied at Berlin and at Johns Hopkins. He was professor of sociology at Leland Stanford Jr. University in 1893–1900; at the University of Nebraska in 1901–06; and at the University of Wisconsin from 1906. He was lecturer at Harvard in 1902, and at the University of Chicago in 1896 and in 1905. He has been advisory editor of the *American Journal of Sociology* since 1895. In 1914–15 he was president of the American Sociological Society. Author of ‹Honest Dollars› (1896); ‹Social Control› (1901); ‹Foundations of Sociology› (1908); ‹The Changing Chinese› (1915); ‹The Old World in the New› (1914); ‹South of Panama› (1915); ‹Russia in Upheaval› (1918), etc.

**ROSS, George,** American patriot: b. Newcastle, Del., 1730; d. Lancaster, Pa., July 1779. On his admission to the bar in 1751 he settled in Lancaster, Pa. As a member of the Pennsylvania assembly 1768–70, he drew up the declaration of rights which was presented by the assembly to the proprietary government. He was a member of the Continental Congress from 1774–77, and as such was one of the signers of the Declaration of Independence. In 1779, three months before his death, he was made judge of the Admiralty Court of Pennsylvania.

**ROSS, George,** Canadian physician: b. Montreal, 11 March 1842; d. November 1892. He was graduated at the McGill University in 1866, and in that year was appointed apothecary to the Montreal General Hospital. He was professor of hygiene at McGill University in 1871–73; held the chair of clinical medicine in 1872–89, and in 1889–91 was vice-dean and professor of medicine there. He was president of the Medico-Chirurgical Society of Montreal and of the Canadian Medical Association, and governor of the College of Physicians and Surgeons of Quebec. He was co-editor of the *Medical and Surgical Journal* and the *Medical Journal*, both published in Montreal, and wrote extensively on aneurism.

**ROSS,** Sir **George William,** Canadian statesman: b. near Nairn, Ontario, 18 Sept. 1841; d. 1914. He was educated at the Toronto Normal School and the Law School of Albert University and after several years of educational work was called to the bar in 1887. He served in the Canadian House of Commons in 1872–83; was Minister of Education for Ontario in 1883–99, and Premier and Treasurer in 1899–1905. From 1907 he was a member of the Canadian senate. He was noted as a public speaker and as a worker for temperance, besides doing much to improve the educational system of Ontario. Author of ‹The Universities of Canada› (1896); ‹The School System of Ontario› (1896); ‹The Senate of Canada› (1914).

**ROSS,** Sir **Hew Dalrymple,** British field-marshal: b. Galloway County, Scotland, 5 July 1779; d. London, 10 Dec. 1868. He was educated at the Royal Military Academy, Woolwich, and was commissioned in the artillery in 1795. He served in the Irish Rebellion of 1798, and commanded the famous «Chestnut Troop» of the Royal Horse Artillery in the Peninsular War of 1809–14 and at Waterloo. He was appointed deputy adjutant-general of artillery at headquarters in 1840, and until his retirement in 1858 practically directed the British field artillery, and sent it to the Crimean War in the best condition of any part of the army. He was responsible for the establishment of the School of Gunnery at Shoeburyness and the Royal Artillery Institute at Woolwich. He reached the rank of field marshal in 1868, receiving also the G. C. B.

**ROSS,** Sir **James Clark,** English explorer: b. London, 15 April 1800; d. Aylesbury, Buckinghamshire, 3 April 1862. He was a nephew of Sir John Ross (q.v.) whom he accompanied on the voyage in search of a northwest passage in 1818. Between 1819 and 1827 he accompanied Captain Parry upon his four Arctic explorations, and was a member of the expedition of his uncle in 1829–33. His discovery of the north magnetic pole in 1831 raised him to the rank of post-captain; but it was in his memorable voyage to the Antarctic Ocean in 1839–43 that he rendered his most valuable contribution to science. He succeeded in reaching lat. 78° 10′, and discovered a great ice-bordered continent which he named Victoria Land, and an active volcano which was called Mount Erebus after the discoverer's ship. For these services he was knighted in 1844. In 1848 he was a member of the party which made an unsuccessful attempt to discover the fate of Sir John Franklin. He became rear-admiral in 1851. An account of his Antarctic expedition was published by him in 1847, entitled ‹A Voyage of Discovery and Research in the Southern and Antarctic Regions.› Consult O'Byrne's Naval Biographical Dictionary; Markham, ‹Fifty Years' Work of the Royal Geographical Society.›

**ROSS, Janet Anne Gordon,** English author: b. London, 24 Feb. 1842. A daughter of Sir Alexander Duff Gordon, she was married to H. J. Ross, a banker of Alexandria, Egypt, in 1860, was for three years Egyptian correspondent of the London *Times,* and since 1867 has lived in Italy. She has published ‹Italian Sketches› (1887); ‹Three Generations of Women› (1888); ‹Leaves from our Tuscan Kitchen› (1899); ‹Florentine Villas› (1901); ‹Old Florence and Modern Tuscany› (1904); ‹Florentine Palaces› (1905); ‹Lives of the Early Medici› (1910); ‹The Fourth Generation: Reminiscences› (1912). She was on terms of close friendship with George Meredith, and is the original of Rose Jocelyn in ‹Evan Harrington.›

**ROSS, John,** American patriot: b. Ross-shire, Scotland, 29 Jan. 1726; d. Philadelphia, Pa., March 1800. After a mercantile experience of 20 years in Perth, he emigrated to America at the beginning of the rebellion of its colonies and became at once a staunch defender of the cause of independence. In June 1774, as chairman of the meeting of Philadelphia merchants in protest against British importations, he signed the agreement presented to the authorities and otherwise resisted unjust taxation.

**ROSS, Sir John,** English Arctic explorer: b. Balsarroch, Scotland, 24 June 1777; d. London, 30 Aug. 1856. He entered the navy at 9 and was promoted lieutenant in 1805. His first Arctic expedition was made in 1818, when, with Lieutenant Parry, he made a voyage in search of a northwest passage to the north pole. His second Arctic voyage was made in 1829 in a small vessel equipped at the expense of Sir Felix Booth, high sheriff of London, which proved inadequate for the purpose. The exploring party was frozen up in the ice for four winters, and was rescued in 1833 by Ross's old ship, the *Isabella,* in Lancaster Sound. He was knighted for his services in 1834, and made rear-admiral in 1851. In 1839 he was appointed consul at Stockholm, and served until 1846. He made an expedition in search of Franklin in 1850. He was the author of ‹A Voyage of Discovery› (1819); and ‹Narrative of a Second Voyage in Search of a North-west Passage› (1835).

**ROSS, John, or KOOWESKOOWE,** Indian chief: b. Georgia, 30 Oct. 1790; d. Washington, D. C., 1 Aug. 1866. He was a Cherokee half-breed who became chief of his tribe in 1828. In 1817–19 Georgia attempted to remove the Cherokees from its borders through a bribe offered to Ross, who had received an English education and was a man of importance in his tribe. He exposed the attempt and continued to repulse the concerted effort of the people of the State to effect their removal. In 1829 Ross, as chieftain, successfully appealed to the Supreme Court of the United States against the action of the Georgia legislature in expelling his people; nevertheless the Cherokees were banished in 1838.

**ROSS, Jonathan,** American jurist and statesman: b. Waterford, Vt., 1826; d. Saint Johnsbury, Vt., 22 Feb. 1905. He entered Dartmouth College in 1847 and was graduated in 1851. He earned his early education by working on his father's farm during the summer, and by teaching school during the winter. After graduating, he taught in Craftsbury and was principal of the academy at Chelsea, Vt. Meanwhile he studied law and was admitted to the Orange County bar in 1856, practising until he was elected in 1870 as assistant judge of the Supreme Court. He was elected chief judge in 1890. Judge Ross was State attorney for Caledonia County 1862–66, represented Saint Johnsbury in the legislature 1865–66, and in 1869 was a member of the last council of censors held in the State. In 1870 he represented Calendonia County in the State senate was for several years a member of the State board of education, and early in 1899 was appointed by Governor Smith to succeed Justin S. Morrill in the United States Senate.

**ROSS, Robert,** British soldier: b. 1766; d. Baltimore, Md., 12 Sept. 1814. He was graduated at Trinity College, Dublin, in 1784, and was commissioned an ensign in the British army in 1786. He served in Holland in 1799, in Egypt in 1801, and later at Naples and in Spain. He was in command of a brigade sent to America in 1812; won a victory at Bladensburg, 24 Aug. 1814, and pushing on to Washington that evening took the city and burned the public buildings. He then moved upon Baltimore, but was mortally wounded and died before he could be returned aboard ship.

**ROSS, Sir Ronald,** British physician: b. 13 May 1857. He was educated in medicine at Saint Bartholomew's Hospital, London, and entered the Indian Medical Service in 1881. He began a special study of malaria in 1892, and won the Parker gold medal in 1895. He engaged in experimental verification of the mosquito theory of malaria in 1895; discovered the life history of malaria parasites in mosquitoes in 1897–98; and in 1899 headed the expedition which found the malaria-bearing mosquitoes in West Africa. He received the Nobel Prize in medicine in 1902 in recognition of his services in regard to malaria. He retired from the Indian Medical Service with the rank of major in 1899. He was appointed professor of tropical sanitation at the University of Liverpool and the Liverpool School of

Tropical Medicine; became physician for tropical diseases at King's College Hospital in 1913; and in 1914 was appointed consulting physician for Indian troops engaged in the European War. He was knighted in 1911. He was an editor of *Science Progress* and of *Annals of Tropical Medicine*. Author of many scientific papers, several novels and 'Philosophies and Other Poems'; 'Mosquito Brigades and How to Organize Them' (1901); 'Malarial Fever' (9th ed. 1902); 'Prevention of Malaria' (1910).

**ROSS, Sir William Charles,** English miniature painter: b. London, 3 June 1794; d. there, 20 Jan. 1860. He began exhibiting at the Royal Academy at 15. In 1821 his 'Judgment of Brutus' gained the gold medal of the Society of Arts. His most ambitious religious picture, 'Christ Casting out the Devils from the Maniacs in the Tombs,' exhibited at the Royal Academy (1825), was the last large canvas that he executed. Henceforth he devoted himself to miniature. He was knighted in 1842 and elected R.A. in 1843 and became the most fashionable painter of his time in his chosen department. He painted Queen Victoria, Prince Albert and their children, the King and Queen of the Belgians, the King and Queen of Portugal, Prince Louis Napoleon (afterward Napoleon III) and many English celebrities. The total number of these exquisite works, as calculated from his own memoranda, was 2,200. He wisely attempted to give to the miniature that breadth of treatment which distinguished Reynolds, whom he evidently took for his model. His drawing was invariably correct, and marked by a nameless elegance enhanced by the truthfulness and clearness of his flesh tints and his clever handling of textures. His miniatures are still considered the models of their class in England. He was an enthusiast in his profession and on his death-bed almost his last words were expressions of regret that photography would destroy the art of painting in miniature. Consult Williamson, 'History of Portrait Miniatures' (1904).

**ROSS, William Potter,** Cherokee Indian leader: b. at the foot of Lookout Mountain, Tenn., 28 Aug. 1820 d. Fort Gibson, 20 July 1891. His father was a native of Scotland and his mother was a sister of John Ross, who was principal chief of the Cherokee Nation from 1828 to 1866. His early education was obtained in the Presbyterian mission school at Will's Valley, Ala., and at the Greenville (Tenn.) Academy. He finished his preparation for college at the Hamil School, Lawrenceville, N. J., and then entered Princeton College, where he pursued the full classical course and whence he was graduated with honor, in 1842. The following year he entered public life as the clerk of the Cherokee senate. In 1844, he was selected as the first editor of the *Cherokee Advocate*. He subsequently filled other public positions in the Cherokee Nation. In the latter part of 1861, the Cherokee Nation entered into a treaty of alliance with the Confederate States and agreed to furnish a regiment of troops for the Confederate military service. This action was taken against the better judgment of William P. Ross but he felt himself bound by it. He was commissioned lieutenant-colonel of the Cherokee regiment which was raised in compliance with the terms of the treaty. The regiment became demoralized and practically ceased to exist soon after the battle of Pea Ridge, Ark., in 1862. He accepted a parole as a Confederate officer and took no further part in the war. He was an active participant in the Indian peace council which was convened at Fort Smith, Ark., in September, 1865. After the death of Principal Chief John Ross, in August, 1866, William P. Ross was elected as his successor for the unexpired term. In 1867, he was one of the commissioners deputed by the Cherokee Nation to negotiate the agreement with the people of the Delaware tribe whereby the latter were incorporated into the citizenship of the former. He was a prominent and active participant in the annual inter-tribal councils which convened at Okmulgee between 1870 and 1878. At the first of these councils, which held sessions in September and December 1870, he was named as chairman of the committee which framed «the Okmulgee Constitution,» proposed and submitted as an organic union of the several tribes in the Indian Territory. In 1873, upon the death of Principal Chief Lewis Downing, he was again elected to fill an unexpired term. After retiring from public life, in 1875, he assumed the editorship of the *Indian Journal* at Muskogee, and subsequently he filled similar positions on the *Indian Chieftain*, at Vinita, and the *Indian Arrow*, at Fort Gibson and Tahlequah. He was a man of remarkably versatile attainments, interested in agriculture and horticulture and in the cause of education, a talented writer, an orator of power and eminent as a lawyer.

**ROSS, The Man of** (real name John Kyrle), English philanthropist: b. Dymock, Gloucestershire, 22 May 1637; d. Ross, Hertfordshire, 7 Nov. 1734. He was educated at Balliol College, Oxford, and lived thereafter on his estates at Ross. Possessed of large means he lived in the simplest manner and devoted his time and income to the general good of the countryside. He was made famous as 'The Man of Ross' by Pope, who wrote of him in 'Moral Essays' (Vol. III).

**ROSS FAMILY, The,** prominent in the creation of the United States flag. The 3rd Continental Congress, 14 June 1777 adopted the report of Gen. George Washington, Robert Morris and George Ross, and declared that the national flag of the United States shall be, of stars and stripes, red, white and blue. George Ross a member of the flag committee, also a signer of the Declaration of Independence, suggested that the widow of his nephew Col. John Ross, be chosen to make the new cloth flag. George Ross was three times chosen a delegate to the Continental Congress. He was a judge; he died in 1779, age 49.

When the Revolution broke out the family of the Rev. George Ross went with the colonists, except one son, who as a learned and influential attorney remained true to the king, and managed to make untold trouble for the family of Ross as well as all the other «Rebels» as he earnestly termed them. The other son of the Reverend Ross was a man of more courage and daring; he asserted himself and became one of the eloquent men who assisted in arousing the people of Philadelphia to resist the demands of the king, and if needs be, to greet the newly arrived soldiers with the outstretched sword. His independent nature so impressed itself upon the community that he was sent with Benjamin Franklin and others as delegates to the Continental Congress which in 1776 framed and signed the Declaration of Independence. Wonderful as was his record in this convention of giants, he will be ever remembered as having been the man who was eager to have a flag for the continental army which would be emblematic of all the colonies, and when the committee was appointed to design a national banner, George Ross was placed with General Washington and Robert Morris, as a committee to prepare such a symbol. It was probably he, rather than Washington who suggested Mrs. Betsy Ross as the proper person to make that flag, although she was known to Washington, as she had for many years made some of the fancy vests of George, and her laces were in evidence on a few of General Washington's coat sleeves. But it was most likely that George Ross suggested that they call on his nephew's widow, Mrs. Elizabeth Ross, as she was not only the handiest, most dexterous needle worker in the Quaker City, but since her husband had recently been buried, death resulting from his heroic service in the continental army, and since she was continuing the dead soldier's business, that of upholstering, she was not only deserving this compliment but needed the money. Robert Morris, too, knew her well, and he like the other distinguished men of Philadelphia were embroidered and belaced by her dainty threads of silk and satin. While it is uncertain which of the committee suggested her, though the evidence seems to point to, George Ross (his sister was the wife of a signer of Declaration of Independence, George Read), the facts are she did make the flag, and made it according to a design agreed upon by the committee.

Her husband, John, was a volunteer and he was the son of the third son of Rev. George Ross who came from Scotland; his name was Amos and he was the rector of Trinity Church, Philadelphia, and his fame as an orator lives to this day in the records of the church. John was in the service of the continentals and while guarding the powder at a wharf, the explosion which took place killed him and destroyed valuable property. This accident took place in January 1777. See UNITED STATES FLAG.

But our colonial dame did not remain a widow long, in fact while she was stitching the new flag, on 13 June, her mind was not only on the wedding of the colonies into one great nation, but was also more deeply interested in her second wedding which was held over until the flag was approved or adopted — for on 14 June 1777 the Continental Congress accepted the emblem and on the next day, Sunday, 15 June, she was married to Joseph Ashburn a sea captain.

She continued to make flags for the government while her newly wed half kept up his sea service. His boat was sailing in the interests of the continentals and he was captured by the British and taken to English land where he was confined in a prison near Portsmouth. Here he died in March 1782. John Claypoole, a young Philadelphian, also a prisoner, was later released and upon his return to Philadelphia visited Mrs. Betsy Ashburn some time in May. While the colonial dame was busy making the flag, Claypoole was busy making love and Betsy finished her task on 13 June while Claypoole completed his task 15 June and on that day Betsy Griscom-Ross-Ashburn-Claypoole, began a new life of romance. To this marriage was born four daughters. The «Widow Ross» who made our first flag and her daughters for many years after were employed to make the government flags. On 30 Jan. 1835, she died at Philadelphia at the age of 84. Her maiden name was Griscom, she was the daughter of Samuel Griscom, a builder. She was a worshipper at Christ Church, Philadelphia, where her pew is now marked with a brass tablet; she was buried at the south Fifth street God's acre, but in 1857 her remains were transferred to a lot in Mount Moriah Cemetery where a well-marked grave is kept in floralized form, by the Daughters of the Revolution. On a tall hickory flag pole daily from sunrise to sunset, floats the «Star Spangled Banner» over the remains of the woman, who first formed it into a thing of beauty and a joy forever. (See FLAG DAY). The Ross who planted the family in America came from Scotland where he was born 1676, just 100 years before the Declaration of Independence. He was a Presbyterian minister but later left that church and joined the Episcopalian creed. Immediately after this religious change he came to America, and landed at Delaware, where he rapidly grew in the favor of the entire New World and he was known as one of the most learned and popular in the colonies at that period. He was chaplain to a number of proprietory governors.

LIEUT. B. J. CIGRAND, U. S. NAVY,
*Author of 'Real History of U. S. Flag.'*

**ROSSA, O'Donovan** (real name JEREMIAH O'DONOVAN), Irish political agitator: b. Rossa-Carbery, near Skibereen, County Cork, 1831; d. New Brighton, Staten Island, N. Y., 25 June 1915. He joined the Phœnix Society in 1856, and in the course of its transformation from a literary to a revolutionary society became one of its leaders. He was an advocate of the most extreme and violent measures and was nicknamed «Dynamite Rossa.» With other members of the Phœnix Society he was arrested for political activities in 1858 and was imprisoned for six months, but was released on a plea of guilty. He emigrated to America in 1862 and continued actively to promote the Fenian cause. Returning to Ireland in 1863 he became connected with the Fenian organ, *The Irish People*. The paper was seized in 1865, and O'Donovan was held on a charge of treason-felony. He was sentenced to imprisonment for life, but was released under an amnesty act of 1871 and banished for life. He returned to the United States, became a naturalized citizen, and continued his work against the British government, publishing the *United Irishman* in New York. Upon the expiration of the 20 years of his banishment necessary to be served he was permitted to visit Ireland, and remained there in 1891–1900. He spent the remaining years of his life in the United States.

**ROSSBACH,** rŏs'bäcн, Germany, village in Prussian Saxony, 8 miles southwest of Merseburg. It is famous as the scene of the victory won 5 Nov. 1757, by Frederick the Great over the allied French and Imperial Armies under Charles de Rohan, Prince de Soubise; Joseph Frederick William, Duke of Saxe-Hildburghausen; and General Tildzeugmeister of the empire. The Prussians were heavily outnumbered, but won an important victory, the entire action consuming only one and one-half hours.

**ROSSE**, rŏs, **William Parsons**, 3d Earl of, British astronomer: b. York, 17 June 1800; d. Monkstown, Ireland, 31 Oct. 1867. He was educated at Dublin University and at Magdalen College, Oxford, where he was graduated in 1822. He was member of Parliament for King's County from 1823 to 1834, and succeeded his father in the earldom in 1841. In 1845 he was elected a representative peer of Ireland, but took little interest in politics. During the stormy discussions on the first reform bill he was occupied with the construction of his first famous reflecting telescope, the speculum of which had a diameter of three feet, and was soon superseded by one of double the size. The two great defects which had hitherto baffled opticians in constructing large reflecting mirrors were spherical aberration and absorption of light by specula, and in the casting of those of large size there arose the apparent impossibility of preventing cracking and warping of the surface on cooling. Even the proper admixture of the metals for the reflector had to be ascertained by numerous and costly experiments. At last, however, a gigantic speculum, weighing three tons, was turned out without warp or flaw and was then polished and mounted on a telescope 52 feet in length in Lord Rosse's park at Parsonstown, at a cost of $150,000. The sphere of celestial observation was immensely widened by an instrument so powerful; nebulæ which had defied Herschel's telescope were resolved into stars and new nebulous mist was revealed to the observation. The construction of the telescope, effected under the earl's direction and superintendence, is fully described in the ‹Philosophical Transactions of the Royal Society, of which body he was president, 1849–54.

**ROSSELLI**, rŏs-sĕl'lē, **Cosimo**, Italian painter: b. Florence, 1439; d. there, 1507. He was a pupil of Neri di Bicci, the representative of the early Florentine school and this school furnished the guiding principles of his artistic life, which was especially influenced also by the work of Benozzo Gozzoli. The altar-pieces and frescoes which he produced were filled with figures dressed in the costumes of his day, and the realistic minuteness of his faces seems to suggest that they were portraits of his contemporaries. He was in short a genuine Pre-Raphaelite of the Florentine school. His finest work is a fresco in the chapel of Saint Ambrogio at Florence: ‹The Exhibition of a Miracle-working Chalice,›— a fashionable religious function of old Florence, displaying the silks, laces and jewelry of the time in all their splendor. Among other good works of his may be mentioned ‹The Coronation of the Virgin› and an ‹Assumption,› both at Florence. He was called to Rome in 1480 by Sixtus IV, and contributed to the decoration of the Sistine Chapel, with the approval of the Pope, who admired his lavish use of gold and ultramarine. Among his pupils the most celebrated were Pietro di Cosimo and Fra Bartolommeo (q.v.). He produced few easel pictures, but one of these, ‹The Annunciation› (1486), was sold in 1847 for $1,627 in England.

**ROSSELLINI**, rōs'sĕl-lē'nē, **The**, a surname applied to the five sons of the Florentine, Mattio di Domenico Gambarelli; all of whom attained distinction in the fine arts and of whom the oldest and the youngest, Bernardo and Antonio Rossellino (qq.v.) became famous sculptors, while Domenico, Maso and Giovanni also did excellent work. Consult Bode, W., ‹Die Italienische Plastik› (1882).

**ROSSELLINO, Antonio** (real name Gambarelli), youngest of the Rossellini (q.v.), Florentine sculptor: b. about 1427; d. about 1479. Little is known of his life except that he was a pupil of his elder brother, Bernardo (q.v.) and that his work was influenced by Donatello and Alberti. His work is characterized by great beauty and delicacy. He is best known for his tomb of the young cardinal prince Portogallo in San Miniato, Florence, which he executed in 1461. He copied it with some slight changes for the tomb of Mary of Aragon, wife of the Duke of Amalfi, in the church of Mount Oliveto, Naples.

**ROSSELLINO, Bernardo** (real name Gambarelli), Florentine sculptor and architect, eldest of the Rossellini (q.v.): b. Settignano, 1409; d. Florence, about 1464. He studied under Alberti and also gained something of his mastery through study of the work of Donatello. Under popes Nicholas V and Pius II he made restorations of the famous buildings of ancient Rome and restored Saint Peter's and the Vatican, but this work is largely lost through alterations made in the 17th and 18th centuries. He built the palaces at Oliveto and Spoleto and the baths at Viterbo; as well as a palace, a cathedral and city hall at Pienza, the native town of Pope Pius II, previously known as Cosignano. The monument to Leonardi Bruni in Santo Croce was executed by him in 1444; and busts of Saint John and Battista Sforza are among his other works.

**ROSSER, Thomas Lafayette**, American soldier and civil engineer: b. Campbell County, Va., 15 Oct. 1836; d. 29 March 1910. He entered West Point from Texas in 1861, but when President Lincoln ordered that class into the field after the attack upon Fort Sumter, Rosser resigned and entered the Confederate army, in which he was appointed 1st lieutenant of artillery and later captain. In 1862 he was made lieutenant-colonel and shortly afterward colonel of the 5th Virginia regiment under J. E. B. Stuart. In 1864 he became major-general in the army of Northern Virginia. He refused to surrender at Appomattox; escaped through the Federal lines, and while trying to reorganize scattered troops was captured and made a prisoner of war. After the war he studied law, but did not practice. In 1868 he became assistant engineer in the construction of the Pittsburgh and Connellsville Railroad; engaged on the Northern Pacific in 1870, becoming the next year chief engineer of its construction through Minnesota, Dakota and Montana; in 1881 became chief engineer of the Canadian Pacific Railway. In 1886 he returned to Virginia to reside, and in the war with Spain in 1898 commanded a volunteer brigade.

**ROSSETTI**, rŏs-sĕt'tē, **Christina Georgina,** English poet, daughter of Gabriele Rossetti (q.v.); b. London, 5 Dec. 1830; d. there, 29 Dec. 1894. She was educated at home. Her first verses were written in 1842 and printed in the private press of her grandfather, Gaetano Polidori. She was probably her brother Dante's first model, and many portraits of her exist both as portraits and as figures in his paintings. A volume of her verse came from the Polidori press in 1847 and, later after the establishment of ‹The Germ› in 1850 she contributed to it under the name of «Ellen Alleyne.» Of a deeply religious temperament, she was a devoted High Churchwoman and her writing, aside from devotional manuals and strictly religious works, was mainly poetry of a devotional character. ‹Goblin Market,› however, published in 1862, is not of this type; and for original and purely imaginative qualities was never afterward approached by her. She also wrote ‹The Prince's Progress› (1866); ‹A Pageant› (1881); stories and nursery rhymes under the titles, ‹Commonplace› (1870), and ‹Sing Song› (1872); ‹Verses› (1873), and such religious works as ‹Annus Domini› (1874); ‹Called to be Saints: the Minor Festivals› (1881); ‹Time Flies: a Reading Diary› (1885); ‹The Face of the Deep› (1892). From 1871 to her death she was for most of the time an invalid. Consult Mackenzie Bell, ‹Christina Rossetti: a biographical and critical study› (1898).

**ROSSETTI, Dante Gabriel,** English poet and painter: b. London, 12 May 1828; d. Berchington, 10 April 1882. His full name was Gabriel Charles Dante, but for literary purposes he rearranged it in the form by which he is now remembered. He was one of four children, all of whom, especially himself, his sister Christina and his brother William Michael, achieved fame in literature. His father, Gabriele Rossetti, professor of Italian in King's College, was an Italian exile, an enthusiastic patriot, himself a poet and author of several critical works on Dante. He had married Frances Mary Lavina Polidori, of English and Italian blood.

Dante Gabriel was educated at home, in an atmosphere of culture and fine enthusiasms; from his ninth to his 14th year he attended King's College. During that time he received some instruction in drawing, and upon leaving college he gave himself to the study of art, entering the Royal Academy in 1848. At the same time he began his translations from Dante and other Italian poets, showing from the first more genius in poetry than in painting. His great poem, perhaps his most remarkable, ‹The Blessed Damozel,› was written about 1847. In 1848 he entered the studio of Ford Madox Brown, where he met Woolner, Holman Hunt and Millais — the group that with himself and Madox Brown constituted the so-called pre-Raphaelite brotherhood. In 1850 William Michael Rossetti edited *The Germ*, a short-lived but famous magazine devoted to pre-Raphaelite ideals; in its page appeared ‹The Blessed Damozel› and other work of Dante Gabriel Rossetti's. Just what were the ideals of the pre-Raphaelites is hard to define; they stood in general for the devotional sincerity in art of those painters who preceded Raphael, and for freedom from modern academic canons; yet Rossetti himself was not strictly a pre-Raphaelite; his drawing was quite in his own style, little affected by the manner of the old painters.

For some time Rossetti had to face the proverbial artist's struggle; his pictures were not bought, and the peculiarities of his drawing were severely criticized. Ruskin's kindly defense of the pre-Raphaelites, however, encouraged the whole group. Shortly afterward Ruskin made Rossetti a standing offer to buy, up to a certain sum, all of Rossetti's painting that pleased him. The arrangement lasted for some time, to Rossetti's great benefit. Through Ruskin he met Sir Edward Burne-Jones, who introduced him to Morris and Swinburne. Ruskin also generously assumed the cost of Rossetti's first volume, the ‹Early Italian Poets,› a collection of translations which appeared in 1861. Rossetti afterward paid back the loan, and the book was reprinted in 1874 under the title of ‹Dante and His Circle.›

In most of Rossetti's early pictures, his Beatrices and ideal ladies were copied after his wife, Elizabeth Eleanor Siddal, herself a poet and artist, whom he had married in 1860. Mrs. Rossetti was an invalid; the poet had no delusions as to the sadness shortly in store for him. But when, in 1862, his wife accidentally hastened her fate by an overdose of laudanum, Rossetti gave way impetuously to his grief, and in his impulsive despair buried in his wife's coffin the manuscript of his poems, for the most part inspired by her.

In the course of the next seven years — during which time he continued his painting with success, and also began the use of chloral — his friends persuaded him to recover his manuscripts, which he did in 1869. The following year appeared his ‹Collected Poems,› containing the ‹House of Life› sonnet sequence in its original complete form. In October 1871, Robert Buchanan, under the pen-name of «Thomas Maitland,» wrote an essay entitled ‹The Fleshly School of Poetry,› in the *Contemporary Review*. The purpose of this article was to show that Rossetti's poetry, in thought and expression, was indecent; and to make his point the writer did not shrink from misquoting Rossetti and perverting his meaning. Rossetti made an adequate reply in an article called ‹The stealthy School of Criticism,› and in later editions somewhat unnecessarily withdrew the verses that had most offended Buchanan. But the injustice of the attack preyed upon him until his mind was deranged; at one time only the loving care of his friends prevented him from committing suicide.

He partly recovered his mental poise, and for a time entirely recovered his poetic and artistic faculties, which seemed at first not to be affected by his use of chloral. Several of his best pictures belong to this time; the ‹Ballads and Sonnets› were published in 1881. These last years, however, were years of pitful suffering and gradual collapse. His friends sheltered him from his worst moods and cared for him to the end.

In both painting and poetry Rossetti's personality expressed itself with unusual evenness throughout his career, and in ‹The Blessed Damozel,› one of his earliest poems, almost all his qualities can be traced. Like so much of his other writing, it was illustrated, set to painting, as it were, by himself; but without such aid the pictorial genius is strong in the verse. The ideas are typically concrete; not only the Damozel, leaning on the bar of Heaven, is seen, with the lilies in her hand, and on earth the fall of autumn leaves, and in the sky the «curled moon»; but from all points of view the appeal is to the eyes, as in that imaginative glimpse of the world spinning far below the bridge of Heaven; and in the picture of souls ascending to God like thin flames—such as William Blake could have drawn; and in that «strong level flight» of the angels. The three lilies in the Damozel's hand and the seven stars in her hair, and the five handmaidens of the Virgin are definitely numbered for the effect of concreteness; Rossetti habitually employs the device, as Keats employed it in the ‹Belle Dame Sans Merci,› after the manner of the old English ballads — a manner that strongly influenced Rossetti. Partly from the ballads ‹The Blessed Damozel› derived some of its mediæval flavor; but the quality was really personal with the poet. Here as in his other poems Rossetti manages to reproduce the romance of the archaic, without any great reproduction of the archaic itself. The furnishing of Heaven in the poem is quaint and remote, in effect like the lovely names of the five handmaidens; but the thought or attitude of no particular past time is revived. Perhaps some of this pseudo-archaic flavor comes from the strange verse-music, which Rossetti introduced into English. The secret of much of its charm is veiled in the poet's genius, but its most striking trait, its melancholy evenness, can be explained by Rossetti's training in Italian prosody. In writing English poetry he departs radically from the genius of English metre; instead of fitting the words, with their natural accents undisturbed, into the regular beat of the verse — so placing them that the natural reading of the line would determine the rhythm,— Rossetti allows a preconceived rhythm to determine the accent of the words, as in the line «With her five handmaidens, whose names,» etc.

These characteristics of ‹The Blessed Damozel,› and others besides, reappear more marked in other poems — the subtlety of thought, in ‹Love's Nocturne›; the mediæval mood of devotion, altogether or almost religious, in ‹Ave,› and in ‹The Portrait,› with its splendid closing image; the ballad element, together with the unusual skill in reproducing physical sensation, in ‹Eden Bower,› ‹Troy Town,› and the longer ballads; and the same sad, even music in them all. Among his other verse the elaborate ballads —‹Rose Mary,› ‹The White Ship,› ‹The King's Tragedy,› show Rossetti's debt to ballad literature, and at the same time mark the wide gulf between the clear simplicity of the old narratives and the wrought loveliness of his work. In his shorter ballads, however, such as ‹Stratton Water,› he is much simpler. What hold he had on real life is powerfully concentrated in ‹Jenny,› probably his most thoughtful poem.

Rossetti's sonnet sequence, ‹The House of Life,› undoubtedly places him among the masters of the sonnet form, though none of the sonnets, perhaps, are so well known as ‹The Blessed Damozel.› Technically, they have more of the rise and fall of the best Italian models than is usual in English poetry, and at times, as in the first sonnet, or the 24th or the 25th, their cadence is superb. But in many of them the mystical subject matter is baffling, and Rossetti's characteristic evenness of manner, here also an evenness of mood, makes the sequence monotonous at last. Perhaps Rossetti's best sonnets were written singly for pictures — as the beautiful ‹Lilith,› and the ‹Venus Verticordia,› with the three wonderful lines at the end.

The most widely known of Rossetti's translations are the three from Villon, especially the ‹Ballad of Dead Ladies,› and Dante's ‹Vita Nuova.› In all of his translated verse, however, the same traits are found as in his original work — the same exquisite, rather than great mood, the same concrete, yet remote, aspects of beauty, and the same un-English music of the verse. He has many imitators in both his arts. See HOUSE OF LIFE.

**Bibliography.**— The best edition is by W. M. Rossetti. For biography and criticism, consult Introduction to the above; ‹Dante Gabriel Rossetti; His Family Letters,› with memoir by Rossetti, W. M.; Caine, Hall, ‹Recollections of Dante Gabriel Rossetti›; Pater, Walter, in ‹Appreciation›; the same essay in Ward's ‹English Poets.› Recent studies are by Benson, A. C. (1906); Marellier (1901); Singer (1908), and Symons, Arthur (1909).

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**ROSSETTI, Gabriele,** Italian poet: b. Vasto Abruzzo Citeriore, 28 Feb. 1783; d. London, England, 26 April 1854. He was educated at the University of Naples and in 1814 was appointed curator in the Museum there. He joined the Liberals and in 1815 became a member of the secret society of the Carbonari. He was a supporter of the constitution which King Ferdinand was forced to grant as the result of a military uprising, and when in 1821 the constitution was abrogated and its adherents proscribed, Rossetti was compelled to fly the country. He went first to Malta and in 1824 to London, where he was engaged as a teacher of languages and was elected professor of Italian at King's College, London, in 1831. In his political opinions he continued an ardent Liberal, but was in favor rather of a constitutional monarchy than a republic. In religion, though never wholly abjuring the Roman Catholic creed, he was for many years practically a free thinker, though in later years he accepted an undogmatic form of Christianity. In 1845 blindness compelled his resignation from the college. His works include ‹Dante, Commedia› (1826); ‹Lo Spirito antipapale che produsse la Riforma› (1832); ‹Poems› (1833); ‹La Beatrice Dante› (1842); ‹Il veggente in solitudine› (1846); ‹L'arpa evangelica› (1852), etc.

**ROSSETTI, William Michael,** English poet and art critic, son of Gabrielle Rossetti (q.v.); b. London 25 Sept. 1829. He was educated at King's College, London, and entered the excise office in 1845. From 1869–94 he was assistant secretary to the board of inland revenue. He has published blank verse translations of Dante's comedy ‹The Hell› (1865); ‹Lives of Famous Poets› (1878); ‹Life of Keats› (1887); ‹Memoir of Dante G. Rossetti› (1895); ‹Gabriele Rossetti› (translated autobiography 1901), etc., besides much editorial work, including the works of many poets and the ‹Rossetti Papers› (1862–70–1903), and ‹Some Reminiscences› (1906).

**ROSSI, Francesco de,** rŏs'sē, known as IL CECCO DI SALVIATI, Italian painter: b. Florence, about 1510; d. Rome, 1563. He was a pupil of Michelangelo and Parmigiano and a painter of history and mythological subjects. Little is known of his life, excepting that he went to France, made enemies by his eccentric conduct and reckless wit, and found little patronage there. He is said by Vasari to have decorated many Italian palaces, and there are examples of his work in several of the great European collections, including his ‹Charity› in the English National Gallery, and his ‹Holy Family› in the Prado Gallery, which show him to be somewhat mannered in execution, but none the less a painter of the Florence school at its best.

**ROSSI, Giovanni Battista de',** jō-vän'nē bät-tēs'tä dā, Italian archæologist: b. Rome, 23 Feb. 1822; d. there, 20 Sept. 1894. He was distinguished for his studies of the inscriptions of the early centuries of the Church, and made important discoveries in the catacombs. He was made a member of the Berlin Academy of Sciences and corresponding member of the French Institute. He published ‹Inscriptiones Christianæ Urbis Romæ septimo Sæculo Antiquiores› (1861); ‹Roma Sotteranea Christiana› (1864–77).

**ROSSI, Pellegrino Luigi Edoardo,** COUNT, Italian statesman, jurist and economist: b. Carrara, 13 July 1787; assassinated Rome, 15 Nov. 1848. He was educated at the universities of Pavia and Bologna and was appointed to the chair of law at Bologna in 1812. He espoused the cause of Joachim Murat and after his fall in 1815 he escaped to Geneva. There he became professor of criminal law at the academy, was honored by naturalization as a citizen and in 1820 became a deputy in the Cantonal Council. In 1832, as a member of the Extraordinary Diet, he was commissioned to draw up a revised constitution, known as the «Pacte Rossi,» but which was rejected by the Diet, an outcome which caused him to accept an invitation to France. In 1833 he succeeded Say as professor of political economy at the Collége de France, and in 1834 he became a French citizen and was appointed professor of constitutional law. He was sent to Rome as French Ambassador in 1845, but in 1848, after the fall of Louis Philippe, he resumed his status as an Italian subject. He was named Minister of the Interior by Pius IX, but although a statesman of pronounced ability his conservatism in opposing the formation of an Italian confederation made him unpopular and his assassination followed. His greatest fame rests upon his work as an economist. Author of ‹Traité de droit pénal› (1829); ‹Cours d'économie politique› (1838–54); Cours de droit constitutionnel› (1866–67); ‹Mélanges d'économie politique, d'histoire et de philosophie,› published posthumously (2 vols., 1857), etc.

**ROSSINI, Gioachimo Antonio,** jō-ä-kē'mō än-tō'nē-ō rŏs-sē'nē, Italian composer: b. Pesaro, 29 Feb. 1792; d. Passy, near Paris, 13 Nov. 1868. He was born of poor parents, and when only 10 was able to support his mother by singing solos in church. He also took the part of Adolfo in Paer's ‹Camillo› at the theatre of the Commune — his only appearance as a dramatic singer. He began his musical studies with his parents, but later he studied composition and counterpoint under Tesei and Mattei, both of Bologna. His first opera, ‹Demetrio e Polibio,› was composed before his studies under the latter, and even at that stage of his career he had mastered the art of imbuing his music with feeling. His first public appearance as a dramatic composer was at Vienna in 1810, when his opera ‹La Cambriale di Matrimonio› was performed. Successful though it was, it did not contain any definite evidence of power to assert a new school or create a radical change in style. It had been preceded in 1808 by ‹Il Pianto d'Armonia per la Morte d'Orfeo,› a cantata, which gained the prize at the Liceo and was performed in public on 8 August of that year. His next composition was ‹Didone abbandonata,› a cantata, followed by an opera buffa, ‹L'Equivoco stravagante,› which brought him fresh triumphs. Early in 1812 he produced two comic operas, ‹L'Inganno felice› and ‹L'occasione fa il Ladro, ossia il Cambia della valigia,› each of which contained several songs full of force and original melody. He attempted one oratorio, ‹Ciro in Babilonia,› which unhappily proved a failure. In the autumn of 1812 he wrote a musical two-act comedy, ‹La Pietra del Paragone,› produced at the Scala with immense success. In the finale occurs the first instance of his employment of the *crescendo,* for which he became famous later, and which Mosca declared had been borrowed from his own ‹Pretendenti delusi.› In 1813 Rossini composed ‹Tancredi,› an opera based on Voltaire's drama, full of good situations and patriotic sentiment. Its choruses are rich in martial passages. ‹Di tanti palpiti› became popular everywhere and made Rossini the most famous composer living. During that year he also wrote ‹L'Italiana in Algeri,› containing the charming trio ‹Papataci› and the patriotic air ‹Pensà alla Patria.› During the next two years Rossini wrote eight operas, including the well-known ‹Barbière di Siviglia› and ‹Otello,› while in 1817 he produced his celebrated operas ‹La Cenerentola,› ‹La Gazza ladra› and ‹Armida,› but critics still regarded him as a «mere musical figure-maker and a diluter of melody into mere ornament.» ‹Ermione,› his next opera, has been styled a «system of word-painting.» His next notable compositions were ‹Adelaide di Borgogna› (or ‹Ottone Ré d'Italia,› as it is sometimes called), and another oratio, ‹Mosè in Egitto.› The former was produced during the Carnival of 1818 and was warmly received, and the latter at the San Carlo in Naples. During the summer of 1818 he wrote ‹Adina, o il Califfo di Bagdad› for the San Carlo Theatre in Lisbon, and ‹Ricciardo e Zoraide› for the San Carlo in Naples, an opera full of ornament. His ‹La Donna del Lago› seemed to show that Scott's works were becoming popular even in Italy. In this opera and others that followed, such as ‹Maometto,› ‹Zelmira,› ‹Semiramide,› etc., it was plain that Rossini was half a century ahead of his day. His style was changing; his gaiety had disappeared; he was becoming serious. He now visited England, on the invitation of the manager of the King's Theatre in London, to write an opera for that house, to be called ‹La Figlia dell' Aria,' for which he was to receive about $1,200. He arrived in London in December 1823, with his wife, Isabella Colbran, a singer, to whom he had been married about two years, and while there was much lionized. He acted as accompanist at numerous soirées, gave several concerts, singing the solos on two occasions in a cantata which he had composed for the occasion under the title 'Homage to Lord Byron,' and in five months had acquired nearly $35,000. He then undertook the musical direction of the Théâtre Italien in Paris for 18 months at a salary of about $4,000 a year. He here reproduced some of his operas, for example, 'La Donna del Lago,' 'Semiramide,' 'Zelmira,' etc., and also brought out a new one — 'Il Viaggio a Reims, ossia l'Albergo del Giglio d'Oro'— composed for the coronation fêtes of Charles X. The sinecure positions of «Premier compositeur du roi» and «Inspecteur Général du Chant en France,» were now given him, with an annual income of 20,000 francs, or about $4,000. He then revised the music of 'Maometto,' brought out under the title 'La Siège de Corinthe,' and also reproduced 'Mosè,' with many improvements and additions, some of the interpolated airs being taken from 'Armida' and 'Ciro in Babilonia.' He next resolved to try his skill at lyric opera and adapted to the 'Le Comte Ory' some of his favorite music in the 'Il Viaggio a Reims,' but it is said that the best part of the drinking chorus was borrowed from Beethoven's Eighth Symphony. His next opera, commonly regarded as his masterpiece, was 'Guillaume Tell,' which was produced at the Académie on 3 Aug. 1829.

With its completion the prolific career of the composer may be said to have ended, for though he lived nearly 40 years longer, a few songs, his 'Stabat Mater' and the 'Petite Messe Solennelle' are about all he wrote. These 40 years were spent at Bologna and at Passy, where he died.

Determining to revisit Bologna, where his mother had died in 1827 and where his father was still living, he resigned his post, but made an agreement with the government to compose operas for the French stage for the next 10 years, and to produce one every two years, receiving 15,000 francs for each. Should this plan not be carried out, he was to receive a pension of 6,000 francs. On account of the abdication of the king of France and the Revolution of 1830, he returned in November 1830 to Paris. The new government, however, was not willing to recognize the agreement above mentioned, and for several years he fought his case in the courts, it being eventually decided in his favor. During this time he wrote his 'Stabat Mater.' In 1836 he again left Paris for Bologna, where his father died in 1839. He now wrote a number of songs and choruses, among which may be cited 'Inno populare,' for the accession of Pius IX. His wife died in October 1845 and two years later he married Olympe Pelissier, whom he had met in Paris. In 1855 he again returned to Paris. His 'Petite Messe Solennelle' was produced on 14 March 1864 and he afterward scored it for a full orchestra, in which form it was given at the Théâtre Italien on 28 Feb. 1869, three months after his death. «Next to the Emperor,» writes one of his biographers, «he became the first man in this city of arts and artists.»

Rossini's position among the world's greatest composers has been much discussed. His joyous disposition and light-heartedness have been used as arguments against classing him with such profound composers as Mozart and Beethoven, the latter of whom is recorded as having characterized Rossini's work as «degrading the art in general wantonness with a negligence bordering on frivolity.» It has been often said that Rossini's melodies are conspicuous for great sweetness and wonderful sensuous attraction, as for instance in the first finale of 'Cenerentola,' or as evidenced by the jolly roguery of the 'Barber of Seville.' This is unquestionably true and these are the fruits of his special form of genius. They are his natural endowment and probably if he had at that time tried ever so hard to write in a different vein he would have failed. His melodies were intended to please the public, for whom he wrote, and they fulfilled their mission to perfection. That he accomplished much for music cannot be gainsaid, and especially for operatic music in Italy.

Notwithstanding the immense popularity of Rossini's compositions, there have been pointed out certain peculiar features repeated over and over again which have caused some of his critics to temper their praise. Nor were these peculiarities entirely of Rossini's own creation, some of them having been borrowed from the works of Generali, Velluti and others. Prominent among them is the use of the crescendo, «which,» says one, «appears as regularly and invariably in his overtures and finales as horseradish with a joint of roast beef.» The constant use of triplets is another mannerism which has provoked adverse criticism, while the undue prominence of appogiaturas (leaning notes), in many cases of longer duration than the harmonic notes to which they are attached, has also been condemned, as well as his practice of closing his periods by modulating them from the major tonic to the minor mood of the lesser third below, or of the great third above the major tonic. A more serious charge made against him was that of plagiarism, it being stated that besides resorting to the national airs of Italy, he availed himself to a great extent of the ideas of Generali, Cimarosa and other Italian composers, as well as of several German composers, such as Haydn, Mozart, Krommer, etc. Thus, while no competent critic has denied that Rossini possessed genius of an extraordinary character, many are inclined to believe that his inventive faculties were confined within quite measured limits.

In spite of all this, there can be no doubt that his compositions form a memorable epoch in the history of musical art. It was he, moreover, who substituted singing for the endless recitatives which had been in vogue and he also gave the bass voice a leading part, insisting too that a singer should sing the notes of the composer without any additions of his own. He also made the chorus an important feature and fortified the orchestra by adding wind instruments to the strings, which alone had hitherto been used.

It cannot be questioned that wherever his operas appeared, they became firmly established and in many instances almost banished the classic works of the great masters who had preceded him. Thus, in Italy, they nearly supplanted the works of Pæsiello, Mayer and others, including even Cimarosa. In Germany the national predilection was for graver music, but even there Rossini was, as one of his biographers put it «lord of the ascendants.» While he rarely, if ever, reached the tragic grandeurs of Gluck, or the intense feeling of Mozart and Weber, his music is never dolorous and heavy, as is the case with some of the best compositions of the German school. Forceful and precise rhythm is another of his principal characteristics, while his scores are notable for their simplicity of outline and primary conception, although his manner of decorating the framework was at times intensely florid. Consult biographies by Beyle-Stendhal (1823; new ed., 1892); Azvedo (1865); Edwards (Boston 1881); Zanolini (1875); Bevan, W. A., ‘Rossini’ (New York 1905); Dauriac, L., ‘Rossini’ (Paris 1905); Corradi, E., ‘Gioachino Rossini’ (Rome 1909); Sittard, J., ‘Rossini’ (Leipzig 1882).

**ROSSITER,** rŏs'ĭ-tėr, **Thomas Pritchard,** American artist: b. New Haven, Conn., 29 Sept. 1817; d. Cold Spring, N. Y., 17 May 1871. He early developed a talent for art and secured Jocelyn of New Haven as his instructor. He studied in Rome 1840–46, and on his return opened a studio in New York, where he was elected a National Academician in 1849. He painted historical and religious subjects, and was an admirable colorist.

**ROSSLAND,** rŏs'land, Canada, an incorporated city since 1897, in the West Kootenay District, British Columbia, on the Canadian Pacific and Canadian Northern railways, near the international boundary line at an altitude of 3,461 feet. It is the receiving and distributing centre for one of the richest gold mining districts of British Columbia. Silver and copper are also found, and great smelters and reducing works have been erected here and at Trail, about 10 miles distant. Pop. 3,000.

**ROSTAND,** rō'stäṅ, **Edmond,** French poet and playwright: b. Marseilles, 1 April 1868; d. 2 Dec. 1918. He obtained his education at the Marseilles Lycée and the Collège Stanislas of Paris, and in 1891 was admitted to the practice of law. He first came into prominence as an author in 1888, when his ‘Le gant rouge,’ a vaudeville sketch, was produced in Paris. About that time a small volume of poems, entitled ‘Les Musardises,’ appeared, but attracted scant notice; nor was ‘Pour la Grèce’ (1897), a poem which he recited for the benefit of wounded Greeks and Cretans in the Græco-Turkish War, much more successful. As a playwright, however, he at once met favor. His ‘Les romanesques’ (1894), ‘La Princesse lointaine’ (1895) and ‘La Samaritaine’ (1897), all in verse, were applauded by public and press. But they were quite outdone by his ‘Cyrano de Bergerac’ (1897), a five-act drama in verse, which proved to be one of the most conspicuous successes of the modern stage, being presented in Paris 500 times consecutively, with Coquelin in the title-rôle. It was given also in the United States in English by Richard Mansfield and in French by Coquelin. It employs the historic figure of de Bergerac, duelist and author. ‘L'Aiglon’ (1900), based on the story of the king of Rome, was given in the United States by Sarah Bernhardt, who created the part in Paris, and in English by Maude Adams. M. Rostand was at the height of his popularity when ‘Chantecler’ was produced in Paris in 1910. Seats sold for $50 and the American rights for its presentation cost a fortune. ‘Chantecler’ originally had been written for the French actor, M. Coquelin, who died before rehearsals and the title-rôle was then given to Guitry. The play was not a conspicuous success and its presentation in English with Maude Adams in the title-rôle was even less successful.

M. Rostand had been made a member of the French Academy, 30 May 1901, the youngest «Immortal» ever admitted; he was raised to the rank of Commander of the Legion of Honor, received a grand diploma for writing ‘Chantecler’ and was lionized at many brilliant assemblages. Other poems and plays by M. Rostand were ‘Le pois sacré’; ‘Don Juan’; La Cantique de l'aile’ (1911); Le printemps de l'aile’ (1912); ‘La Belgique,’ and ‘The Song of the Stars.’ Rostand's versification is finished and brilliant, his wit keen and polished and, added to these, his work displays a certain enthusiasm and spontaneity. He contributed, with Stephen Phillips (q.v.), to the much-talked-of renaissance of the poetic drama.

Early after the outbreak of the War of the Nations in 1914 M. Rostand volunteered to fight as a French soldier, but his services were declined. He proceeded to hearten the Entente Allies, however, by writing patriotic verse, and one poem, in which he praised America's attitude, was dedicated to Sarah Bernhardt. When the *Lusitania* was sunk, M. Rostand wrote a long poem excoriating Count von Bernstorff, German Ambassador to the United States, and accusing him of perfidy.

Rostand married early in life Rosamond Gérard, granddaughter of Count Etienne Gérard, a Marshal of France during the Napoleonic wars. They had one son, Maurice, who has collaborated with his mother in writing the plays ‘Un bon petit diable,’ produced in New York in 1913 as ‘A Good Little Devil’ and ‘La petite vendeuse d'allumettes’ (1914). Among English translations are ‘Cyrano’ by Thomas and Guillenard (1898) and Hall (1898); ‘L'Aiglon’ by Parker (1900); ‘Les romanesques’ by Fleming (1900), and Hendee (1899), and ‘Chantecler’ (1910). See Chantecler; Cyrano de Bergerac, and L'Aiglon.

**Bibliography.**— Filon, ‘De Dumas à Rostand’ (Paris 1898); Chesterton, G. K., ‘Varied Types’ (New York 1903); Hale, E. E., Jr., ‘Dramatists of To-Day’ (6th ed., ib. 1911); Lewisohn, Ludwig, ‘The Modern Drama’ (ib. 1915); *Edinburgh Review* (October 1900) and *L'Illustration* (1898, 1910).

**ROSTOCK,** rŏs'tok, Germany, in the state of Mecklenburg-Schwerin, on the left bank of the Warnow, 80 miles northeast of Lübeck, is one of the most important cities on the Baltic. It consists of three parts: The Old, the New and the Middle Town. The east or Old Town bears the impress of an old Hanse town; the Middle Town is the most modern and best built. The most noteworthy points of interest are the palace of the grand duke; the town-house, with its seven towers; the church of Saint Mary (1400) and church of Saint Peter, with a steeple 414 feet high; the university (1419), attended by about 500 students; the house in which Blücher was born and the one in which Grotius died; schools, hospitals, etc. The fine promenades surrounding the city were formed on the site of the old fortifications. There is an extensive trade in agricultural products and salt, and important fisheries. Pop. 65,400.

**ROSTOPCHIN,** rŏs-tŏp'chĭn, or **RASTOPCHIN, Feodor Vassilievich,** Count, Russian general: b. province of Orel, 23 March 1763; d. Moscow, 12 Feb. 1826. He entered the Imperial Guards as lieutenant, was highly promoted under Paul I, but afterward dismissed in disgrace. Under Alexander he became governor of Moscow and exercised an important influence over the campaign of 1812, even if the assertion of the French that the burning of the city was his work should be untrue. He himself denied this charge in his 'Vérité sur l'incendie de Moscow' (1824). It is certain, however, that he caused his villa near Moscow to be burned and took measures for the destruction of the magazines in that city. In 1814 he accompanied the Emperor Alexander to the Congress of Vienna. He afterward traveled and spent several years in literary pursuits in Paris. His works include a number of historical memoirs, comedies, etc., written in French and Russian and published in 1853. Consult Schnitzler, 'Rostopchine et Koutousoff'; Segur, 'Vie de Comte Rostopchine.'

**ROSTOV,** rŏs'tŏf, or **ROSTOFF,** Russia, in the government of Ekaterinoslav, picturesquely situated on a prominent summit above the Don, 20 miles from its mouth in the Sea of Azov. It is the oldest town of eastern Russia, a centre of considerable traffic and some domestic industries, and its annual fair establishes the prices of cotton goods preliminary to the great fair of Nijni-Novgorod. The chief objects of trade are grain (the principal article of export), flour, tobacco, drugs, herbs, saddlery, linen manufactures and enameled sacred pictures. It has ever counted as an important point, from the period when it was first contended for by Slavs and Finns. After the Mongolian invasion it declined and was successively plundered by Tartars, Lithuanians and Poles. Electric lighting, street railroads and telephones are among its modern features. The ancient cathedral (1216) contains precious sacred relics of Christian missionaries and princes. Pop. 121,300.

**ROSTRA,** a name given the platform or stage in the forum in Rome, whence the orators used to harange the people, so called from the beaks (*rostra*) of the ships taken, in 338 B.C., from the Antiates, with which it was adorned. It was a circular structure raised on arches, with a stand on the top, bordered by a parapet, the access to it being by two flights of steps.

**ROSWELL,** rŏz'wĕl, N. Mex., city and county-seat of Charles County, on the Rio Hondo, a tributary of the Pecos River, 150 miles southeast of Albuquerque, on the Atchison, Topeka and Santa Fé Railroad. The New Mexico Military Institute is located here; there are flour mills, and the city is the centre of rich cattle, sheep and farming country. It was incorporated as a city in 1904 and is growing steadily. Pop. (1910) 6,172; (1920) 7,062.

**ROSWITHA,** rŏs'vē-tä, or **HROTSWITHA,** hrŏts'vĕ-tä, German poet: b. about 932; d. about 1002. She was of Saxon birth and a nun in the Benedictine convent of Gandersheim, Brunswick; the first German poet and the first dramatist since the Roman period. She wrote sacred legends, a poetical chronicle of the reign of Otto I and six Latin comedies for performance before the sisterhood. The latter were imitations of Terence, and without attempting a development of character they displayed rapidity of action and good theatric effect. Her works were first published at Nuremberg in 1501; translations were made by Benedixen in 1850–53. The best edition was published by Barack in 1858. Consult Köpke, 'Hrotsuit von Gandersheim' (1869).

**ROSY FINCH,** one of the large finches of the genus *Leucosticte,* native to the northern parts of Asia and northwest America. Several species inhabit the higher parts of the Rocky Mountains and the colder parts of northwestern America, coming southward in winter. Their plumage is suffused with rose-red, brightest in the males, and in the spring they have a loud and pleasant song. The best-known species is *L. tephrocotis,* common in Colorado and Utah in winter. Consult Coues, 'Birds of the Northwest' (1874).

**ROT,** a disease in sheep and other graminivorous animals, produced by the hydatids *Fasciola hepatica* and *Distoma lanceolatum,* often living in great numbers in the gall-ducts and bladder of the animal. (See Sheep). Also the popular name for many fungoid diseases of plants. See Diseases of Plants; Fungi.

**ROTA ROMANA,** rō'tä rō-mā'nä, or **RUOTA ROMANA,** signifies an ecclesiastical tribune of the Roman Catholic Church situated at the papal court; from this situation probably comes the name of the tribunal, since the old papal courts were decorated with mosaics in the shape of wheels or *rotæ.* The Rota Romana was at one time a body of vast judicial power, having jurisdiction not only over all cases of appeal and all disputes of beneficiary and patrimonial nature, but as well over the more important class of all cases concerning ecclesiastical benefices. These last are no longer within the jurisdiction of the court, its power being diminished of necessity by the political position of the papacy of to-day. But over the first two classes named the court has full jurisdiction, its decree being final, inasmuch as the only appeal permitted is one directly to the Pope.

The Rota Romana was, and still is, a collegiate body, although its constitution has undergone radical changes in recent years. Originally it was composed of 12 prelates, mostly Italians, but representing also the other papal states of Catholic Christendom. The meetings which took place in the palace of the Pope twice a week were of supreme importance in the administration of the Roman Catholic Church law throughout the world. The Tribuna is now divided into two colleges or senates.

**ROTARY STEAM ENGINE,** a type of engines in which the pistons rotate within the cylinder, or the cylinder upon the pistons, thus giving a continuous rotary motion and eliminating the loss of power consequent to the necessary change in the direction of motion of a piston working horizontally in a cylinder, as in the case of an engine operating with a reciprocating action.

The varieties of rotary engines are numerous, consisting of machines equipped with one, two, three and four pistons on single axes, or of pistons working in pairs on several axes, operated by steam injected against them, or working by the reactive action of steam emitted tangentially. The basic principle was suggested by the inventors of the last century, among whom Watt, Cartwright and Galloway may be included; while among the notable engines of this class may be mentioned the Scheutz (Swedish), the Thompson (Scotch), the Behrens (American) and the Pillens and Hill (English), in all of which the pistons revolve within the cylinder and differ from each other only in the details of the mechanical arrangements employed to utilize the pressure of the steam.

In another form perfected by Harris, portions of the engine are attached to two hubs and run in different directions. The hollow trunnions of one axis carries the two radial arms which emit steam at their ends tangentially against vanes carried on the other axis with a direct driving action. By gearing the two motions are utilized upon a single shaft. The latest development, and perhaps the most efficient, is that perfected by William M. Hoffman, of the type in which the cylinder revolves around the pistons upon an elliptical steam-chest supported by a hollow shaft through which the steam is admitted and exhausted.

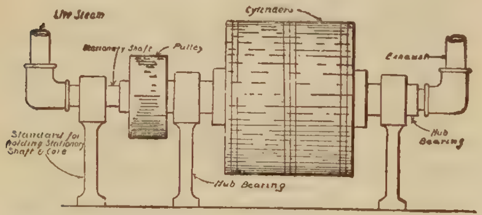

FIG. 1. Standard for holding stationary shaft and core.

Fig. 1 shows a side view of the Hoffman engine in which the shaft and core, or steam chest, are stationary and the cylinder revolves. Live steam is admitted at the left end of the hollow shaft and is utilized by the action of an automatic cut-off arrangement which allows it to enter the expansion chamber from the stationary core, where it expands and pressing against a piston moves it forward over the elliptical surface of the core and in so doing causes the cylinder to revolve. As the piston approaches the greater dimension of the ellipse, it is forced into its housing, where it forms an abutment against the escape of steam; while a piston in its housing on the opposite side of the cylinder arrives opposite the port of exhaust exhausts the steam, and, relieved of the pressure of the greater dimension of the ellipse, emerges from its housing, and forms the free side of a new chamber, into which the live steam is again admitted by the automatic cut-off to expand and continue the action while steam is admitted to the shaft. The expansion chamber is so arranged that it has but three sides — the inner surface of the cylinder and the outer surface of the ellipse, both of which are rigid, and the convex surface of the pistons, which are free to move in and out of housings in the cylinder casing.

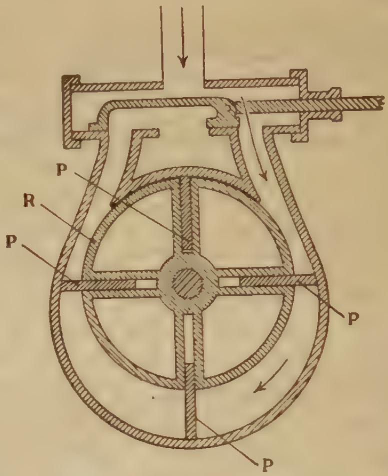

FIG. 2. Common efficient type of Rotary Engine.

The chief defects of this type of rotary engine are the excessive loss of power by friction of the pistons against the core and the complicated system of valves, steam ports, connecting arms, etc., which are difficult to keep in proper order. Many forms of rotary engine are entirely free from valves and steam ports. The type illustrated in Fig. 2 uses the expansion of the steam in one long curve, for almost a complete revolution of the rotor R. The pistons P slide in grooves in the rotor R and are pushed against the cylinder by helical springs. When steam is admitted it pushes the first piston ahead and with it the rotor until the next following piston is exposed to its action. Near the exhaust port the piston is pressed into its groove and as it passes the port the steam is exhausted.

Rotary engines are designed to obtain the greatest possible efficiency with the least amount of fuel consumption and a great reduction in engine-room floor space. Engines capable of developing 300 horse power at 2,000 revolutions per minute have been successfully and economically operated.

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**ROTATION,** (a) *in astronomy,* the turning round of a planet on its imaginary axis, like that of a wheel on its axle. The rotation of the earth is performed with a uniform motion from west to east and occupies the interval in time which would elapse between the departure of a star from a certain point in the sky and its return to the same point. The only motions which interfere with its regularity are the precession of the equinoxes and nutation. The time taken for the rotation of the earth measures the length of its day. So with the other planets. The sun also rotates as is shown by the movement of spots across its disc (see SUN). The earth's rotation slightly increases the force of gravity in moving from the equator to the poles. Sir William Thomson, reasoning from some small anomalies in the moon's motion, inferred that 10,000,000 years ago the earth rotated one-seventh faster than it does now, and that the centrifugal force then was to that now as 64 to 49; (b) in botany, the movement of the protoplasm observed in the cells of cell-walls of certain plants. Little or nothing is definitely known as to the causes that bring it about, but it is probably related to the similar motion in amœba and other low orders of animal life; (c) in mechanics. See MECHANICS.

**ROTATION OF CROPS,** the order in which crops are grown during a series of years on the same land. The advantages of this practice are: (1) All plants tend to exhaust the soil, but in different degrees, hence a rotation tends to maintain a balance. Thus at the Rothamsted Experiment Station, England, where wheat has been grown on the same land for 62 successive years without manure or fertilizers, the average yield is about 13 bushels per acre, or nearly the same as the average yield in the United States, while where grown in a four-course rotation of rutabagas, barley, beans or clover, wheat, the average yield during a period of 52 years is nearly 27 bushels per acre, without manuring or fertilizing. (2) All plants do not take up the same ingredients in the same proportion; thus, crops rich in carbonaceous matter take up relatively small amounts of food from the soil, but large quantities from the air, the latter costing nothing. (3) Some crops give better opportunity for cleaning land, as corn, potatoes. Others cannot be tilled and favor the growth of weeds, as wheat, oats. (4) When several crops are grown on a farm the labor is distributed over a greater portion of the year and it is more economical. The social evils consequent on temporary employment at high wages for a short period of the year, and idleness the rest of the time, cannot be overlooked. (5) Plants vary in their ability to assimilate the plant food in the soil; thus buckwheat and rye are able to flourish where wheat and cabbages could hardly live. (6) The legumes enrich the soil in nitrogen. (7) A variety of crops is essential where cattle and other livestock are kept. (8) In a rotation the increase of destructive insects and diseases is hindered, owing to their not having the necessary crop to prey upon. (9) Some crops permit the sowing of others among them, thus saving time; clover and grass seeds being sown among barley and wheat, wheat sown among corn. (10) Some crops permit the aggregation of the soil particles when they become excessively reduced by tillage, hence land is laid down to grass, alfalfa. (11) Certain crops aid in accumulating humus, as grass, hence such should follow two or three years of exhaustion by tillage. Admitting air to the soil tends to destroy humus and to reduce the water-holding capacity. The loss of humus has converted garden-spots in New York and other Eastern States, northern Africa, Asia Minor and Spain into wastes, and Sicily, the granary of Italy in the time of the Romans, is now comparatively sterile.

Rotations are described according to the number of years required to complete a circuit, as three-course, four-course, etc. In the latter the tillable land is divided into four parts and each crop is grown on part of the farm each year. The folly of growing the same crop on the same land for several successive years was noted by the Romans and others, as also the benefits derived from growing a leguminous crop, as alfalfa or clover, previous to a grain crop, as wheat. These observations remained unutilized until a comparatively recent date. Rotations have gradually grown into their present forms according to circumstances, and have been and are modified as required and as our knowledge increases. Attention was first drawn to their value in 1777, in a treatise by Dickson of Edinburgh, Scotland.

One of the earliest recorded systems was the «outfield» and «infield,» in which part of the land was used for growing grain until its crop-producing power was so reduced that it became unprofitable, when it was allowed to lie idle for a number of years. Increase of population caused a modification, the land being rested or «fallowed» a year at intervals; thus, among the Jews, this was repeated every seventh year. A system of continuous single cropping has been pursued in the Western States with distinct loss to the nation. Where land is weedy and in dry districts, as parts of California, the east of England, etc., bare fallowing or the cultivation of the soil without growing a crop is still considered good practice, sufficient moisture being conserved to ensure a profitable crop the succeeding year. A development from this system consisted of the introduction of green crops, either intertillage crops, as corn, turnips, potatoes, cabbages, etc., if the land was weedy and needed cleaning, or of legumes, as clover. The advantages of a crop-fallow are that the land is turned to profitable use; it is cleaned and the available nitrogen present as nitrates is not so liable to be lost by percolation, being taken up by the crops; that humus is produced from the root-residue; and that if a leguminous crop is grown it enriches the soil in nitrogen by means of the bacteria on its roots.

In 1788 Marshall of England stated that a common rotation was: 1st year, wheat, barley or bigg; 2d year, oats. beans and pulse; 3d year, bare fallow. A distinct advance was made with the realization of the value of the Norfolk four-course, which was practised on light land and originally consisted of roots, barley, clover, wheat. The principles involved are (1), that a deep-rooted crop shall succeed a shallow-rooted one, barley being shallow-rooted and clover deep-rooted; (2) that crops of the same natural order and somewhat like tendencies, as wheat and barley, both being straw-crops and more or less subject to similar enemies, shall not succeed each other; (3) that a weedy crop shall be followed by a cleaning one, as the roots after the wheat; and (4) that a leguminous crop shall have a place in each rotation. The advantages of this system were: (1) The wheat was grown after a nitrogen-gathering crop; the clover stubble was readily prepared for wheat in the fall, or if stock feed was scarce it could be pastured late and spring wheat or oats grown instead. The wheat was harvested in time to permit the land being fall-plowed and cleaned for the succeeding root crop. (2) The fallow crop, roots, received manure and intertillage, and gave an opportunity to clean the land and stir it deeply. It furnished work for the horses in summer in cultivating, and a bulky crop of succulent feed for stock, which with the hay furnished considerable manure. (3) A grain-crop follows well after a root crop, and generally little or no plowing is needed. Barley is a good crop to seed with, as it occupies the land but a short time and is not so exacting on the soil moisture as oats. (4) The clover requires a firm seed-bed, and if the roots were consumed on the land and shallow tillage given in fitting the land for the barley, such was secured. The barley permitted a good growth of clover which enabled it to withstand the winter. This crop supplied the hay. The disadvantages of this system are that it is too short, the land being liable to become both clover and turnip sick, and the turnips affected with «club-root.» Under these circumstances clover and turnips could be taken every eighth year, substituting beans, peas or cowpeas for the former, and potatoes, etc., for the latter. Such close cropping renders the rotation expensive, the labor bill being high, but the cost may be reduced by leaving the grass and clover seeding down for two or three years, thus making a five or six years' rotation, or it may be used as the basis for a seven or eight course. This rotation is capable of adaptations as follows: (1) Grain — wheat, oats, barley, rye, corn, buckwheat; (2) cleaning or fallow crop — corn, potatoes, sugar beets, mangels, tobacco, cabbages, turnips, rutabagas, rape, cowpeas, soy beans, sorghum, etc.; (3) Grain — barley, oats, rye, wheat, corn; (4) Legume — clover, grass and clover, cowpeas, soy beans; (5) Legume — grass and clover, mown once and pastured, or pastured all the year.

In the United States the rotations of crops vary considerably in different sections. In many places the succession of crops is dictated rather by accident or convenience than by any well-considered principles. Corn and wheat or oats formed a common two-course rotation with the early settlers, until the land failed to produce a crop of wheat when corn was grown every second year, the land going to weeds in the interval. The «Eastern Shore rotation,» which is a two-course, consists of corn followed by oats, with a secondary crop of Magothy Bay beans. The growth of this leguminous crop, while curtailing the yield of oats, furnishes considerable green manure for plowing in. The first system on the best cultivated farms in Virginia was a three-course, beginning with corn, and succeeded by wheat in which the grass and weeds were allowed to grow and be grazed the third year. One well-known farmer in Virginia grew clover in place of the weeds the third year to furnish green manure. A later rotation was: (1) corn or oats; (2) wheat and clover sown; (3) clover grown and plowed under in August, and the land seeded to wheat for the fourth year.

An old and successful rotation recorded for New England is corn, oats and timothy and clover, the latter remaining down for three years; thus two plowings are required in five years, one for corn, and a light plowing for oats, the grass and clover seed being sown among the oats. A modern three-course rotation for the Eastern States is potatoes, winter rye, clover. This is a modification of a well-known Middle Western rotation, potatoes, winter wheat, clover. It embraces a root crop, a cereal and a leguminous crop. It is well suited to light and medium soils and is economical in labor, but one deep plowing being required in three years, that for the potatoes, the land being prepared for the rye by discing. The potatoes are a cash crop, the rye furnishes bedding and feed for stock, and the clover furnishes hay, and is not left down long enough to be seriously injured by the clover-root worm. The rotation is too short for many places, and probably the land would become clover-sick. It may be converted into a four-course by growing a crop of corn after the clover, and into a five-course by sowing grass with the clover and leaving them down for two years, thus corn, potatoes, rye, grass (timothy, redtop, etc. clover), mown, grass mown and grazed. In this way two-fifths of the tilled land is plowed each year, that for corn and potatoes; the land for potatoes may be plowed in fall after the rye is sown in September, thus reducing the spring work. If milch cows are kept, the corn furnishes grain and stover or may be cut for silage, the rye may be cut green for fodder or allowed to mature, and the area in potatoes might be reduced and cowpeas, soy beans, peas and barley, or some other fodder or silage crop substituted.

For a dairy farm having half the land in permanent pasture, a satisfactory four-course is (1) corn (cut for silage); (2) oats, the land being fall-plowed, the crop furnishing grain and bedding; (3) wheat (sown in fall, the grain being sold or consumed, the straw used for bedding); (4) clover (sown in spring in the wheat). This rotation permits of carrying the maximum amount of livestock and having a large supply of manure, thus enabling the crop-producing power of the soil to be maintained or increased. The livestock furnish constant employment and enable the farmer to make two profits, that of the grower and the manufacturer.

A common rotation in the Middle West is corn, wheat and clover. The wheat is sown in the corn with a one-horse drill before the latter is mature, the clover being sown in the wheat. Labor is a serious problem, and this system economizes it, but one plowing being required. Consult Wheeler, ‹A Rotation of Crops,› Bull. 74, 75, 76, Agr. Exp. Sta., Rhode Island (1900); Gilbert, ‹Memoranda of the Rothamsted Experiments› (1901); Parker, E. C., ‹Field Management and Crop Rotation› (Saint Paul 1915). Consult also works referred to in article AGRICULTURE IN THE UNITED STATES, all of which emphasize the imperative necessity of rotation if our lands are to be saved from exhaustion.

**ROTCH**, rŏch, **Abbott Laurence**, American meteorologist: b. Boston, Mass., 6 Jan. 1861; d. 5 April 1912. He was graduated from the Massachusetts Institute of Technology in 1884, and in the following year established and afterward maintained at his own expense a meteorological observatory at Milton, Mass. On 14 Dec. 1906 he was appointed professor of meteorology at Harvard University. He was the first meteorologist in the United States to measure the height and velocity of clouds, and to use kites with a self-recording instrument for this purpose. He also made experiments in wireless telegraphy. He was the author of ‘Sounding of the Ocean of Air’ (1900); ‘The Conquest of the Air’ (1909).

**ROTH,** rōt, **Frederick George Richard,** American sculptor: b. Brooklyn, N. Y., 28 April 1872. He received his early education in Germany and studied art at the Vienna and Berlin Academies of Fine Arts. He returned to the United States and from 1890 was professionally engaged as a sculptor, attaining a reputation for the excellence of his small animal groups. He has exhibited in New Yrok, Philadelphia, Saint Louis, Chicago, Portland and Düsseldorf; and was awarded silver medals at the Saint Louis and Buenos Aires expositions, and a gold medal at Panama. He was elected to the National Academy in 1906. Five of his small bronzes are in the Metropolitan Museum of Art.

**ROTHERHAM,** rŏth'ėr-ạm, England, county borough in the West Riding of Yorkshire, at the confluence of the Rother and the Don, five miles northeast of Sheffield. The most notable buildings are the 14th century cruciform church, market hall, post office, courthouse, corporation buildings, mechanics' institute and free library.. The town possesses extensive metal and railway carriage works, potteries, glass works and rope yards. It is of Roman origin and was of some importance in the Anglo Saxon period. Pop. 62,500.

**ROTHERMEL,** rŏth'ėr-mĕl, **Peter Frederick,** American painter: b. Luzerne County, Pa., 18 July 1817; d. near Pottstown, Pa., 15 Aug. 1895. He was educated as a land surveyor, but at 22 studied painting, and about 1840 opened a studio as a portrait painter at Philadelphia, and eventually turned his attention to historical subjects. Among his earlier works are ‘Christabel’ and ‘Katherine and Petruchio.’ He has also painted many American subjects, among them ‘De Soto Discovering the Mississippi,’ ‘Columbus Before Isabella the Catholic,’ the ‘Noche Triste’ from Prescott's ‘Conquest of Mexico’; ‘Patrick Henry Before the Virginia House of Burgesses’; and ‘The Battle of Gettysburg.’ His pictures reveal a fine sense of color and a power of dramatic composition which are not common; but he has a tendency to exaggeration and his overtrained action is very often less genuinely effective than sensational.

**ROTHROCK, Joseph Trimble,** American botanist: b. McVeyton, Pa. 9 April 1839. He was graduated at Harvard in 1864, and took his M.D. at the University of Pennsylvania in 1867. He served in the Civil War and was wounded at Fredericksburg. He was professor of botany at the University of Pennsylvania in 1877–93; commissioner of forestry for Pennsylvania in 1893–1905; and in 1905–08 he was superintendent of the State Sanatorium for Consumptives, South Mountain Camp. Author of ‘Flora of Alaska’ (1867); ‘Botany of the Wheeler Expedition’ (1878); ‘Vacation Cruisings’ (1884); ‘Pennsylvania Forest Reports’ (1895–97), etc.

**ROTHSCHILD,** rŏths'chīld (Ger. rōt'-shĭlt). The famous European financial house known as Rothschild was founded by Mayer Anselm Rothschild: b. Frankfort-on-the-Main 1743; d. 19 Sept. 1812. He was of Jewish parentage, and was destined for the priesthood, but found commercial pursuits more to his liking, and engaged in trading, afterward entered a banking house in Hanover. His industry, frugality and sound business methods made him in a few years the master of a small capital, and he returned to Frankfort, where he established the banking house still in existence. The firm originally consisted of his five sons, who established branches of the house in different European cities: Anselm, b. 12 June 1773; d. 6 Dec. 1855; resided in Frankfort; Solomon, b. 9 Sept. 1774; d. 27 July 1855; lived in Vienna; Nathan, b. 16 Sept. 1777; d. 18 July 1836; located at London; Karl (baron), b. 24 April 1788; d. 10 March 1855; resided in Naples; and Jacob (baron), b. 15 May 1792; d. 15 Nov. 1868; resided in Paris. The political events of 1813 raised the house of Rothschild to the important position it has since occupied in the commercial and financial world. In 12 years the Rothschilds raised by way of loan or subsidy an amount exceeding £100,000,000 sterling which was distributed by them in nearly the following proportions: England, £40,000,000; Austria, £10,000,000; Prussia, £8,000,000; France, £16,000,000; Naples, £10,000,000; Russia, £5,000,000; several German courts, £1,000,000; Brazil, £2,000,000; exclusive of various other large sums. The remarkable degree of success attained by the house, setting aside the favorable circumstances of which they have taken advantage, may be largely attributed to their strict adherence to two fundamental maxims laid down by the founder of the house. The first of these is their conducting all operations in common. Every proposition of magnitude is laid before each member of the firm, fully discussed and then executed by their united efforts. The second principle is to set definite limits to each operation and never to aim at exorbitant profits. Their wealth has increased in an unexampled degree, and their reputation and credit have been steadily fortified by fair dealing, reasonable terms and sagacious and systematic operations which are clearly planned and judiciously executed. The Rothschilds are extremely punctual in meeting their contracts, and before the introduction of the telegraph their couriers were frequently in advance of the government. The advantages of their system and their strength were clearly shown when in 1848 they met conjointly a loss of several millions, which would have crushed any other house, but which the enormous scope of their resources enabled them to meet without difficulty. The members of each succeeding generation are admitted into the firm and much intermarriage among cousins indicates that the family is destined long to retain its control of European finance. Lionel Nathan, b. 22 Nov. 1808; d. 3 June 1879, was the first Jew admitted to the English Parliament, and his son Nathaniel Mayer, b. 8 Nov. 1840; d. 13 June 1905, was created a baron in 1883, who was succeeded by his son, Lionel Maitland, b. 8 Feb. 1868, as second baron Rothschild. Consult Reeves, ‘The Rothschilds (1887); ‘Das Haus Rothschild’ (1857); Von Scherb, ‘Geschichte des Hauses Rothschild’ (1893); Michaud et Villeneuve, ‘Histoire de Saint-Simonisme et de la famille de Rothschild’ (1847).

**ROTHSCHILD, Alfred Charles de,** English financier: b. 1842; d. February 1918. He was educated at King's College School, London, and Trinity College, Cambridge. He was a partner in the firm of N. M. Rothschild and Sons, and from 1868 to 1890 a director of the Bank of England. The last of the three brothers who had presided many years over the London branch of the family, he was the second son of the late Baron and Baroness Lionel de Rothschild, and a brother of the late Lord Rothschild. All the brothers died during the war.

**ROTIFERA,** a group of small, usually microscopic animals, are familiarly known as wheel animalcules, because of the presence at the anterior end of a crown of cilia which in their vibration suggest the rotation of a wheel. The opposite (posterior) and of the body is prolonged into a stalk (foot), which is the organ of attachment in sessile forms or is used in walking by such as are free. It is often segmented and may be terminated by one or two pointed toes, while a cement gland in the foot aids in fixation. The anatomy is simple and usually easily studied in the living animal. In general it recalls that of the embryonic annelid with which the rotifers are often genetically connected (see TROCHELMINTHES). A vascular system is wanting and the excretory system consists of «flame-cells.» The sexes are separate, but the males are rare, degenerate and needed only for the production of the fertilized winter eggs. Summer eggs develop parthenogenetically. The rotifers are abundant and widely distributed, but confined almost entirely to fresh water. They were among the very first of microscopic organisms to receive attention, and have always been favorite objects of study. A few forms are parasitic in habit and almost all are capable of desiccation and subsequent revival.

**ROTOGRAVURE,** a process used in reproducing photographic illustrations by means of engraved cylinders, the machine printing both sides of the sheet, illustrations and printing, at the same time. The paper is fed from rolls and the machine delivers it printed, dried and cut into sheets. The process is invaluable because of the rapidity and low cost with which perfect work may be produced, and makes possible the elaborate illustrated supplements of newspapers and magazines. The reproductions are exact and the costly «make-ready» work required with flat plates is eliminated. The principle of the machinery is the same as in that used for wall-paper printing and silk printing.

**ROTTECK,** rŏt'tĕk, **Karl Wenceslaus Rodecker von,** German historian and publicist: b. Freiburg in Baden, 18 July 1775; d. there, 26 Nov. 1840. He was educated at the University of Freiburg, early turned to the study of history and in 1798 was appointed professor of that department in Freiburg University, a chair exchanged in 1818 for that of natural and international law. In 1819 he was chosen by his university as their representative in the first chamber of the states of Baden, and there proved an ardent champion of political reform. He was one of the founders of *Der Freisinnige,* a journal with strong democratic leanings, and brought upon himself the displeasure of the Conservative party, who compelled him to resign his professorship and discontinue the editing of all public prints for five years. An ineffectual attempt was made to exclude him from the second chamber of the states, to which he had been elected representative in 1830; but he continued to hold this seat till his death. His chief work is 'Allgemeine Weltgeschichte' (1813–27). Numerous translations of the original work, or an abridgment published by Rotteck, entitled 'Auszug aus der Weltgeschichte,' have appeared in most European languages. It is a critical narrative of prominent events written from a liberal point of view. Other works are 'Lehrbuch des Vernunftrechts und der Staatswissenschaften' (1829–30); 'Lehrbuch der ökonomischen Politik' (1835); 'Kleinere Schriften' (1829–30); and, with Welcker, a 'Staatslexikon' (1834–44).

**ROTTENSTONE,** a decomposed mineral substance, consisting chiefly of alumina with about one-ninth of carbon and half as much of silica. It is supposed to be formed almost wholly by decomposition of shale, and is chiefly found in Derbyshire, England, in South Wales, and near Albany, N. Y. It is either grayish, blackish or reddish-brown in color, is soft and easily scraped to powder and is much used for cleaning and polishing metallic surfaces, glass, etc. The term rottenstone is now used to include the tripoli of commerce (first imported from Tripoli, Africa), and also any kind of silicious material suitable for the same purposes.

**ROTTERDAM,** rŏt'ėr-dăm (Dutch, rŏt-tĕr-däm'), Netherlands, one of the chief cities and busiest ports of the country, 36 miles by rail southwest of Amsterdam. Important waterways connect the town with the sea and with the interior. Thus vessels of deep draft may approach quite near, and the amount of tonnage entering Rotterdam (including that which is connected with the inland traffic) is only surpassed by London among European ports. The Hoog Straat, built on the protecting dike, divides the city into Binnenstad and Bintenstad. The intersecting canals cut the Bintenstad into islands. The canals or «havens» are Rotterdam's streets, generally speaking, and the principal buildings line the main «havens.» In the Groote Markt is a statue to Erasmus, who was a native of Rotterdam. Saint Lawrence Church, founded in 1414, contains an excellent organ and some fine marble monuments to celebrities. There is an academy of fine arts, various museums and schools of navigation, music and technology. There are also zoological gardens and a public park. The modern public buildings form a remarkable contrast to the quaint old-time wooden gabled houses. Rotterdam carries on an active foreign and domestic trade with her colonies, Europe and America. The imports include native produce from her eastern and western colonies, and grain, coal, oil, seeds, etc. The exports are linen, flax, dairy products, gin and manufactures. Rotterdam boasts many flourishing mills, shipbuilding yards, ironworks and distilleries. Pop. 417,800.

**ROTTI,** rŏt'ē, **ROTTEE,** or **ROTTO,** an island belonging to the Netherlands, in the Indian Ocean, northwest of Australia and southwest of Timor Island. It is of volcanic origin; its greatest length is 36 miles, and greatest width 11 miles; area, 655 square miles. The surface is nowhere above 800 feet high. It has a bold, rocky coast; the surface of the interior is undulating and the soil is very fertile. The lontar, or palmyra palm, furnishes a juice which is one of the principal articles of food. Maize, rice, millet, cotton and tropical fruits are plentiful, and cabinet woods are exported. Horses, goats, sheep, pigs and buffaloes abound. Edible birds' nests and wax are also exported. The natives, supposed to have come originally from Java, are a fine-looking race. Pop. 80,000.

**ROTTMANN,** rŏt'män, **Carl,** German painter: b. Handschuchsheim, near Heindelberg, 11 Jan. 1792; d. Munich, 6 July 1850. He early established himself at Munich, but finding little congeniality in the studies of the academy, interested himself in the natural scenery of the country, which formed the environs of the city, and by his independent studies he actually instituted a new school of German landscape. His masterly pictures attracted the attention of King Louis, who engaged him to paint a series of Italian landscapes; and his frescoes, executed between 1829 and 1833 in the arcades of the palace gardens, are remarkable for color and masterly power in line. Among his oil paintings may be mentioned ‘The Acropolis of Sicyon’ and his ‘View of Corfu,’ now at Munich in the new picture gallery; ‘The Fountain of Callirrhoe,’ at Munich; ‘Perugia’ in the National Gallery at Berlin. While he was a powerful and imaginative painter in oil, his chief claims to recognition in modern art history are his mastery of water colors and his skill in genuine naturalism.

**ROUBAIX,** roo-bā, France, in the department of Nord, six miles northeast of Lille, is a prosperous manufacturing town, containing many mills and factories, dye works and tanneries. Its public buildings are unimportant. Its woolen and linen manufactures and its carpets are celebrated. Pop. 122,700.

**ROUBILLAC,** roo-bē-yäk, **Louis François,** French sculptor: b. Lyons, about 1695; d. London, 11 Jan. 1762. He settled in England about 1720, and a monument designed by him for the Duke of Argyle in Westminster Abbey brought him into great repute. Among his monumental works are statues of Bishop Hough in Worcester Cathedral; of Sir Peter Warren; of Handel in Westminster Abbey; of Shakespeare in the British Museum, and of Sir Isaac Newton at Cambridge.

**ROUCOUYENNE,** roo'koo'yĕn', or **ROUCOUENNES,** a South American Indian tribe of Cariban stock, living in French Guiana around the upper waters of Maroni River. They take their name from *roucou,* the French name for a vegetable with the juices of which they paint their skins. They are thought to be remnants of the true Caribs, or Galibis, who have taken refuge in the interior in order to lead their lives according to their own customs. They are said to permit the marriage of father and daughter and brother and sister. Consult Brinton, D. G., ‘The American Race’ (1891).

**ROUEN,** roo-ŏṅ, France, chief town of the department of Seine-Inférieure, situated on the right bank of the Seine, 87 miles southwest of Paris, ranks next to Lyons as a manufacturing city, and is one of the most attractive provincial towns of the republic. Rouen possesses much interest in its public buildings, many of which are almost perfect specimens of Gothic architecture. They include the venerable cathedral of Notre Dame, the product of centuries of construction; begun in 1220 under Philippe Auguste, it has seen many vicissitudes, but its imposing façade surmounted by lofty towers, its richly decorated walls, its exquisite wood carvings, fine sculpture and beautiful rose-windows render Notre Dame one of the most remarkable and artistic of Christian temples. Among others are the abbey and church of Saint Ouen, also in the Gothic style, whose aerial tower terminates in a crown of fleurs-de-lis; the church of Saint Maclou, a fine specimen of florid Gothic; the Tour de la Grosse-Horloge; the Palais de Justice, of the 15th century, remarkable for the delicacy and boldness of its construction; the Hotel de Bourgthéroulde (15th century), with fine reliefs; the archiepiscopal palace; the musée or picture gallery, containing a fine collection of paintings by French masters, and the ancient Halles or market buildings. There is a large library and several museums of scientific collections. In the Place de la Pucelle Joan d'Arc was burnt. Rouen is the birthplace of Corneille, Fonternelle, Boieldieu and Flaubert. It is the see of an archbishop and seat of law courts, and possesses a chamber of commerce, an exchange, mint and schools of science, art and the higher professions. The staple manufacture is cottons, in every form, one class of which is so specialized as to be known as *rouenneries.* Besides woolen goods, machinery, chemicals, etc., there are numerous industrial works for weaving, refining and smelting. The location of the city favors trade. The main articles are corn, flour, wool, cotton, coal, petroleum, wine, brandy, colonial produce and manufactured goods. Rouen was built before the conquest of Gaul by the Romans. It was captured and pillaged by the Normans in the 9th century. Afterward it was long held by the English until 1449. Pop. 125,000.

**ROUGÉ,** roo'zhā, **Oliver Charles Camille Emmanuel,** Vicomte de, French Egyptologist: b. Paris, 11 April 1811; d. Bois-Dauphin, Sarthe, 27 Dec. 1872. He was educated at the Collège de Saint-Acheul and afterward devoted himself to the study of Egyptology, early gaining a reputation as an authority. He became conservator of the Egyptian Museum at the Louvre in 1849, and professor of Egyptian archeæology at the Collège de France in 1860. He made important advances in the translation of Egyptian hieroglyphics, discovering the prototypes of the Semitic alphabet in the early Egyptian hieratic; and made other valuable contributions to the knowledge of early Egyptian history and religion, as well as formulating an improved system for the study of Egyptian grammar. Author of ‘Examen de l'ouvrage du chevalier de Bunsen: Le place de l'Egypte dans l'histoire du monde’ (1846–47); ‘Mémoire sur l'inscription du tombeau d'Ahmès’ (1851); ‘Rituel Funeraire des anciens Egyptiens’ (1861–63); ‘Memoire sur l'origine Egyptienne de la alphabet Phenicien’ (1874); ‘Chrestomathie Egyptienne’ (4 vols., 1867–76); ‘Inscriptiones hieroglyphiques copiées en Egypte’ (1877–79), etc.

**ROUGE,** roozh, a cosmetic prepared and used to impart artificial bloom to the cheeks or lips. It is applied by means of a camel's hair pencil, puff-powder or a hare's foot. When rouge is properly prepared, it is said that its application does not injure the skin. Jeweler's rouge is an impalpable preparation of oxide of iron obtained by heating the yellow oxalate of iron till it decomposes, carbonic acid escaping, and only a red powder being left. It is used for polishing silver and for this purpose should be of the finest quality.

**ROUGE ET NOIR,** roozh ā nwŏr, or **TRENTE ET QUARANTE,** trŏṅt ā kä-räṅt, a modern game of chance played with the cards belonging to six complete packs. The punters or players stake upon any of the four chances: *rouge, noir, couleur and inverse.* The banker then deals a row of cards for noir, until the exposed pips number between 30 and 40 (court-cards count 10, aces 1), and a similar row for rouge. That row wins which most nearly approaches the number 31, and players staking on the winning color receive their stake doubled. *Couleur* wins if the first card turned up in the deal is of the winning color; in the contrary case *inverse* wins. When the number of pips in both rows are equal it is a *refait,* and a fresh deal is made; but if both happen to count exactly 31 it is a *refait de trente-et-un,* and the banker claims one-half of all stakes. This last condition places the banker at an advantage calculated to be equal to about 1¼ per cent on all sums staked.

**ROUGET, Georges,** zhōrzh roo-zhā, French painter: b. Paris, 2 May 1784; d. there, 9 April 1869. He studied at the École des Beaux Arts and later under David, who employed him to finish many of his pictures. He became in consequence an imitator of that master. He painted a large number of portraits, those of Louis XVIII and of Charles X being noteworthy and historical subjects. Of the latter are ‘French Princes Paying Homage at the Cradle of the King of Rome’ (1812); ‘Death of Saint Louis’ (1817), at Versailles; ‘Œdipus and Antigone’ (1819), at Rouen; ‘Francis I Pardoning Rebels of La Rochelle’ (1822); ‘Marriage of Napoleon and Marie Louise’ (1837); ‘Napoleon Receiving the Decree of the Senate Proclaiming Him Emperor’ (1838); ‘Death of Napoleon’ (1846). Several of the churches of Paris contain religious subjects painted by him, but the major part of his work may be seen at the Versailles Museum.

**ROUGET DE LISLE, Claude Joseph,** roo-zhā dė lēl, French song-writer: b. Lons-le-Saulnier, France, 10 May 1760; d. Choisy-le-Roi, 27 June 1836. He published ‘Fifty French Songs, Words of Various Authors, Set to Music by Rouget de Lisle’ (1826), etc., but is chiefly remembered as the author of both the words and music of ‘the Marseillaise’ (q.v.).

**ROUGH-LEG,** a buzzzard-hawk of the genus *Archibuteo,* especially *A. lagopus,* so called because feathered down to the toes. It is known throughout the northern regions of both continents, and is typically whitish, streaked with rust-red, but the American form best known is a melanotic variety (*A. lagopus sancti-johannis*), which frequents the maritime districts of the Atlantic Coast and is less often seen in the interior, except northerly. The western United States and Pacific Coast have a second species (*A. ferrugineus*), called in California squirrel-hawk, which is rusty brown, marked with gray, white and black, or sometimes plain dark chocolate brown. These hawks are large (23 to 24 inches in length) and of fierce and noble appearance, but they have none of the dash and spirit of the falcons and indeed seem inferior to the buteos in this respect. Their quarry, though diversified, is always humble; they prey upon various field-mice and other very small quadrupeds, lizards and frogs and even insects, rarely attacking birds of any kind, and then only the most defenseless. Open fields, especially in the vicinity of water, are their favorite resorts. They appear heavy and indisposed to active exertion; flying slowly and heavily and often remaining long motionless on their perch. They show some analogy to the owls in points of structure, as well as in their partially nocturnal habits. Wilson observes that it habitually courses over the meadows long after the sun has set, and Audubon calls it the most nocturnal of our species. The nest is ordinarily built of sticks, etc., in a high tree; sometimes, however, on cliffs. The eggs, three or four in number, measure about two and one-third by one and three-quarter inches, largely blotched with different shades of brown, sometimes mixed with purplish slate markings.

**ROUGH AND READY,** a popular nickname applied to President Zachary Taylor during the Mexican War.

**ROUGH RIDERS,** a name borne by the First Regiment of United States cavalry and also by the Second United States volunteer cavalry in the Spanish-American War. The original Rough Riders were the men who carried messages through the Western States before the organization of the pony express in 1859, and the name was used by William F. Cody in his «Wild West» show, which contained a «Congress of the Rough Riders of the World.» The army regiments were thus named because of the great number of Western ranchmen in their ranks, and they played a prominent part in the Spanish-American War. The first regiment was organized by Leonard Wood, who was commissioned colonel, and Theodore Roosevelt became lieutenant-colonel. Before the disbanding of the regiment in 1898 a Rough Riders' Association was formed, to which all members of the regiment are eligible, the right of membership to descend to the eldest son. See ROOSEVELT, THEODORE; and WOOD, LEONARD.

**ROUGH-WINGED SWALLOW,** a small blackish migratory swallow (*Stelgidopteryx serripennis*) of the United States generally, where it nests in summer in holes in banks, in crevices of rocks, etc., and has the general habits of the bank swallow (q.v.). The genus, of which several other species are known in Central and South America, is peculiar in having the outer web of the first wing-quill converted into a series of stiff recurved hooks, which may be supposed useful in creeping into their holes and in clinging to vertical or overhanging surfaces. Considering the general likeness of the bird otherwise to the bank swallow, the fact that this species often makes its nest and lays its pure white eggs in some cranny about a bridge or building is noteworthy. Consult Coues, ‹Birds of the Colorado Valley› (1878).

**ROUGON-MACQUART,** roo-gôṅ mä-kär, **Les,** a series of 20 novels by Émile Zola, relating the history of a family under the Second Empire and published in 1871–93. The novels were intended to form a scientific study of heredity as well as a photograph of French social life. The series begins with ‹La fortune des Rougons› (1871), and this was followed by ‹La curée› (Rush for the Spoil: 1872); a study of the financial world of Paris at the time Haussmann laid out the boulevards); ‹La conquête de Plassans› (1874); ‹La ventre de Paris› (The Markets of Paris; or Fat and Thin: 1875); ‹La faute de l'Abbé Mouret› (1875); ‹Son excellence Eugéne Rougon› (1876), a story of political life; ‹L'assomoir› (Drink: 1877), a story of life among the workmen of Paris; ‹Une page d'amour› (1878), a physical and psychological study of the various phases of a woman's passion; ‹Nana› (1880), a study of the life of a courtesan and actress; ‹Pot-Bouille› (1882), a study of the life of the bourgeoisie; ‹Au bonheur des dames› (The Ladies' Paradise: 1883), a study of the mammoth department stores; ‹La joie de vivre› (1884); ‹Germinal› (Master and Man: 1885), a study of life in the mines; ‹L'œuvre› (1886), a study of artist life; ‹La terre› (1888), a study of peasant life and the greed for land; ‹Le rêve› (1888); ‹Le bête humaine› (1890), a study of railway life; ‹L'argent› (1891), a study of stock speculation; ‹La débâcle› (The Downfall: 1892), a study of the Franco-Prussian War and the Siege of Paris; ‹Le Docteur Pascal› (a pitiful story of incest: 1892). In this last story Pascal Rougon collects all the data relating to his family and sums up their history.

**ROUHER, Eugène,** ė-zhän roo-ăr, French statesman: b. Riom, 30 Nov. 1814; d. Paris, 3 Feb. 1884. He studied law and practised his profession in Riom until his election to the Legislative Assembly in 1849. He became a confidant of Napoleon III and was appointed Minister of Justice. In 1863 he was made Minister of State and in 1870 became president of the Senate and chief of the Napoleonic Cabinet. In 1860 the famous treaty with England was effected largely through his instrumentality in which the free trade policy of Napoleon was inaugurated. His activity in state affairs continued until the fall of the empire, when he fled from France. In 1872 he returned as the Corsican representative in the Assembly, and remained in office until 1875. He was to the last the leader of the Bonapartists.

**ROUINS, The Forty-seven,** a popular Japanese historic-romantic drama, based on the custom of *katakiuchi* (q.v.).

**ROULERS,** roo-lā (Flem. *Rousselaere*), Belgium, on the Mandel, 17 miles south of Bruges. Up to the outbreak of the Great War it carried on an active industry in the manufacture of textiles and a trade in linen, chicory, etc. Pop. 25,000.

**ROULETTE,** roo-let', *in geometry,* the path of any point in a moving plane when a given curve in the latter plane rolls without sliding on a given curve in the former. See Cycloid; Trochoid; Hypocycloid.

**ROULETTE,** roo-lĕt, a French game of chance, in which a small ivory ball is thrown off by a revolving disc into one of 37 or 38 compartments surrounding it, and numbered from 1 to 36, with one or two zeros. Players who have staked upon the number of the compartment into which the ball falls receive 36 times their stake; less if they have staked upon more than one number. There are also other chances on which stakes may be placed.

**ROUMANIA,** a variant spelling of Rumania (q.v.).

**ROUMANILLE,** roo-mä-nēl-ė, **Joseph,** modern Provençal poet: b. Saint-Remy, near Avignon 1818; d. 1891. He was the first French poet to conceive the idea of reviving, as a literary tongue, the local dialects of southeastern France. Accordingly he gathered round him an enthusiastic band of friends, and with their assistance collected materials for a grammar and lexicon and also founded a consistent system of orthography. It was in his program to produce, and favor the production of, genuine poetry, such as would speak to the hearts of the peasantry to whom the dialect was vernacular. In 1852 he edited a collection of Provençal poems by several authors under the title ‹Li Provençalo.› It was mainly under his inspiration that the society of the «Felibres» was formed, and he was the second president of its consistory. His ‹Letters,› edited by Ritter, were published 1894–95, and biographies have been written by De Bouchard (1896) and Ferris (1894).

**ROUND, William Marshall Fitts,** American journalist and reformer: b. Pawtucket, R. I., 26 March 1845; d. Acushnet, Mass., 2 Jan. 1906. He was educated at Harvard, became a journalist, and engaged actively in prison reform. He had served as United States delegate to various European prison congresses, was director and corresponding secretary of the National Prison Association, which he reorganized, and he also organized the Burnham Industrial Farm at Canaan, N. Y. He was the originator of the «Mill» system of awards, since adopted in many institutions both at home and abroad, and was editor of ‹Lend-a-Hand Record.› He wrote ‹Achsah› (1877); ‹Child Marian Abroad› (1880); ‹Rosecroft› (1884); ‹Torn and Mended› (1885).

**ROUND,** a short simple musical composition, written generally for three or more voices on the same clef. Each voice takes up the melody after the first has sung the first phrase or so, the third following the second, as it followed the first, and so on, until after a certain number repetitions the signal is given to stop. It is evident that the melody must be so constructed that each phrase must harmonize with the other, so that, when all the voices are singing, a three- or four-part harmony is heard.

**ROUND ROBIN,** a written protest or remonstrance, signed in a circular form by several persons, so that no name shall be obliged to head the list. This method of bringing grievances to the notice of superiors was first used by French officers, whence its derivation from *rond ruban,* «round ribbon.»

**ROUND TABLE, The.** See Arthurian Legends.

**ROUND TOWERS.** See TOWER, ROUND.

**ROUNDABOUT PAPERS, The,** the title of a work by William Makepeace Thackeray. He became editor of the *Cornhill Magazine* in 1859 and 'The Roundabout Papers' were sketches for this periodical. They appeared simultaneously, between 1859 and 1863, with 'Lovel the Widower' and 'The Adventures of Philip,' and exemplify the author's best qualities as an essayist.

**ROUNDELAY.** (1) A song of any sort in which a line, refrain or idea is constantly repeated. (2) The tune of such a song. (3) A dance in a circle. (4) Specifically, a fixed verse-form, originating in France, and better known as the rondeau (q.v.).

**ROUNDERS,** a game played with a bat and a ball by two parties or sides, on a piece of ground marked off into a square or circle or pentagon, with a batter's station, and three (or more) goals or bases at equal distances. On the ball being thrown toward him the batter tries to drive it away as far as he can and run completely round the goals, or over any one of the four parts, before the ball can be thrown back to the batting station. The batter is declared out if he fails to secure a run after having had three balls, if a fielder returns the ball so as to strike him while running, or if the ball from his bat is caught in the air by one of the fielders. See BASEBALL.

**ROUNDFISH.** See WHITEFISHES.

**ROUNDWORMS,** a common or semi-scientific designation for certain slender cylindrical or spindle-shaped worms mostly parasitic. The term is sometimes applied to the phylum *Nemathelminthes* (q.v.) and again restricted to the class *Nematoda* (q.v.), also called the true roundworms. Some of the species included in these subdivisions are very slender and to such the term threadworms is applied though this designation is regarded by some as equivalent to roundworms. In medical usage the term roundworm is employed to designate especially a few well-known human parasites that fall within the general group of Nematoda. The most famous is the stomach worm or common roundworm, *Ascaris lumbricoides,* which as the name suggests has a certain external likeness to the earthworm. It has been known since the days of Egyptian and Greek medicine as a frequent guest in the human intestine, especially in children. The parasite is 15 to 40 centimeters long by three to five millimeters thick, the male being much smaller than the female and showing two projecting spicules near the posterior end. It is distributed over the entire world, though more abundantly in the warmer regions and in the country than in colder latitudes and in the cities.

The eggs are covered with a very heavy triple shell, the outer layer being rough and mammillated. Within this the embryo may live safely for several years if no chance is offered for further development. The latter begins when the egg is taken into the stomach of the host and its introduction is due to the use of contaminated vegetables or fruits or of impure drinking water. It has been shown recently that the embryos which hatch out in the stomach penetrate to the lung of the host and after a period there return to the intestine where they become sexually mature and the life cycle is complete. While the presence of such parasites may not be fatal, they exert a toxic influence on the host, and give rise to reflex nervous symptoms of a serious character so that prompt measures should be taken under the advice of a physician for their removal. Similar species are found in the pig, sheep, cat, dog and horse, and some of them rarely occur in man. The pinworm, *Oxyurias vermicularis,* is less frequently spoken of in medicine as a roundworm though it is a closely related member of the group of Nematoda. It inhabits the rectum and like Ascaris is most common in children. It is a much smaller worm, measuring only 3 to 12 millimeters in length. It has been known from remotest antiquity as a cosmopolitan parasite of man and is more abundant in the cities than in the country. An intense itching is induced by its presence and if large numbers are present this results in a serious inflammation which may lead to onanism or other similar disturbances. For a description of the group see Nemathelminthes, Nematoda, Gordiacea, Acanthocephala. Particular species are discussed under Filariasis, Guinea-worm, Parasitism, Trichina. For fuller data on these worms consult special works on animal parasites and parasitic diseases.

**ROUP,** roop, an infectious disease of the respiratory passages of poultry, resembling diphtheria in man, but of different origin. It progresses rapidly and is frequently fatal. It has a catarrhal character at its first appearance, accompanied by a cough and with a discharge from the nostrils which quickly becomes fetid. The eyes become closed and the head often swells, while cankers of a diptheritic appearance affect the throat and mouth and may cause death by choking. The most rigid precautions in isolating diseased members of a flock should be observed and disinfection of the premises should follow. An injection of a solution of copper sulphate, one-half ounce to a quart of water, is sometimes effective as a remedy, but at times it becomes necessary to destroy a flock and start with fresh stock on thoroughly disinfected premises. Consult Salmon, 'Important Poultry Diseases' (United States Department of Agriculture, Farmers' Bulletin No. 530, 1914); Kaupp, B. F., 'Poultry Diseases and Their Treatment' (1914); Pearl, Surface and Curtis' 'Diseases of Poultry' (1915).

**ROUQUETTE,** roo-kět', **Adrien Emmanuel,** American Roman Catholic priest and author: b. New Orleans, La., 13 Feb. 1813; d. there, 15 July 1887. He was educated in France, where he studied law, and was graduated from the University of Rennes in 1833. Returning to America he abandoned law for the priesthood and his cherished career as a missionary to the Choctaw Indians, among whom he had spent some years in his boyhood. In 1859 he established a mission in the Indian village at Bayou Lacombe, and thenceforth devoted his life to the Choctaw people, by whom he was greatly beloved. His writings include 'Les Savanes, Poésies americaines' (1841); 'Poèmes patriotiques' (1860); 'Catherine Tegehkwitha' (1873).

**ROUS,** or **ROUSE,** roos, **Francis,** English Puritan: b. Dittisham, Devonshire, 1579; d.

Acton, 7 Jan. 1658–59. He was educated at Oxford and at Leyden; and lived for a number of years in Cornwall, engaged in writing and theological study. He was a member of Parliament from 1625, and in 1657 was made a lord of Parliament. He was a supporter of Cromwell; and, originally a Presbyterian, became an Independent in religion. Of his extensive religious writings ‘Mystical Marriage Between a Soule and Her Saviour’ (1635), gives perhaps the clearest exposition of his religious beliefs. He is remembered for his ‘Psalms of David in English Metre’ (1643), which were authorized by Parliament for general use and are still, in a revised form, sung in Scottish Presbyterian churches.

**ROUSE, William Henry Denham,** British educator: b. Calcutta, India, 30 May 1863. He was educated at Doveton College, Calcutta, and at Christ College, Cambridge. He was a Fellow at Cambridge in 1888–94; master of Rugby School in 1896–1901; and since 1901 has been headmaster of Perse Grammar School, Cambridge. Since 1903 he has also been university teacher of Sanskrit. He was acting professor of Latin at the Columbia Summer School, Teacher's College, New York, in 1912. He has made frequent use of translations in his writings. Author of ‘The Jataha’ (under editorship of Professor Cowell, Vols. II, IV, VI, 1895, 1901, 1907); ‘The Giant Crab and other Tales of Old India’ (1897); ‘Tales from the Isles of Greece’ (1897); ‘Atlas of Classical Portraits’ (1898); ‘A History of Rugby School’ (1898); ‘The Talking Thrush’ (1899); ‘Greek Votive Offerings’ (1902); Jinacaritam, or Life of Buddha’ (1905).

**ROUSES** (rows'iz) **POINT,** N. Y., village, port of entry in Clinton County; on Lake Champlain, and on the Delaware and Hudson, the Rutland and the Grand Trunk railroads; on the boundary between the United States and Canada, about 160 miles north by east of Albany and 21 miles north by east of Plattsburg. A railroad bridge about one mile in length spans the portion of the lake between the State of New York and Grand Isle, in Vermont. The village has steamer connections with the Lake Champlain ports, and by way of the lake and the Richelieu River with many places in Canada. Rouses Point receives a large part of the custom receipts of the Champlain district. Industrial activities include a large printing-house, railroad repair shops, lumber mills and machine shops. The Charbonneau Institute, a high school, public and parish schools and two public libraries are its chief buildings. Rouses Point was a noted locality in the discovery days, and at the time of the Revolution and the War of 1812. Just on the frontier, on an island, is Fort Montgomery. Pop. 1,650.

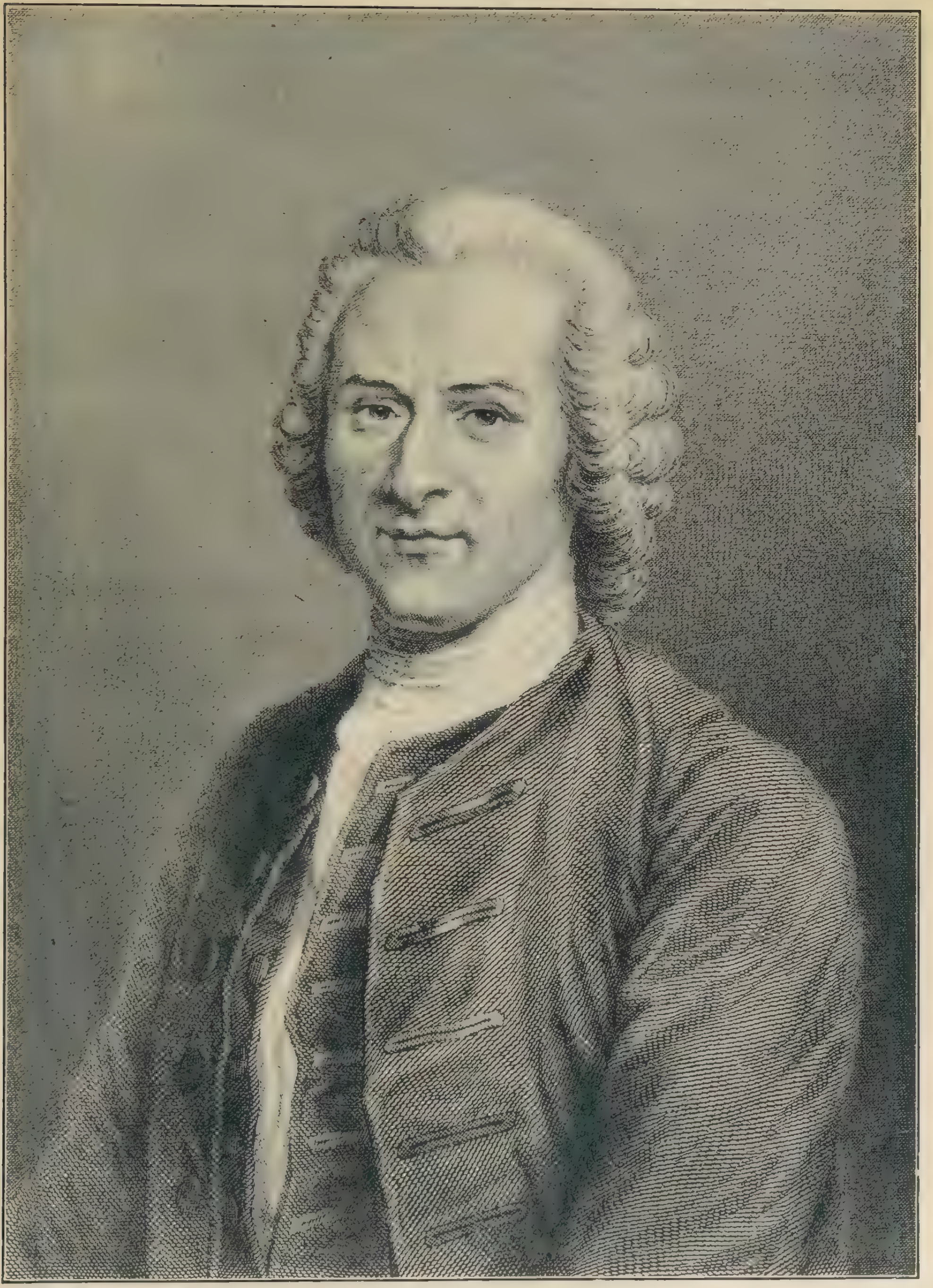
**ROUSSEAU,** roo-sō, **Jean Baptiste,** French poet: b. Paris, 6 April 1670; d. Brussels, 17 March 1741. In 1701 he was admitted into the Academy of Inscriptions and Belles-lettres, and his lyric compositions procured him high reputation among the French literati; but his turn for satire and his quarrelsome temper later involved him in disgrace. He was found guilty of having written libelously agains La Motte and Saurin, and was exiled from France in 1712. The latter part of his life was spent in the Netherlands, where he obtained a pension from the Duke of Aremberg, which he resigned on having forfeited the favor of that nobleman. An edition of his works was published under his own inspection, by Tonson 1723, and since his death they have been often printed in various forms. One of the best editions is that of Latour, with a commentary and life of the author (Paris 1869). His ‘Œuvres Poétiques’ appeared with a commentary (1824), and ‘Contes inédits’ ed. by Luzache (Paris 1881).

**ROUSSEAU, Jean-Jacques,** in point of influence the most striking figure in modern French philosophy and literature: b. Geneva, 28 June 1712; d. Ermenonville, 2 July 1778. His mother died at his birth, so that in his own characteristic phrase his birth was the first of his misfortunes. His father was of unstable disposition and in his attitude toward his son wavered between over-fondness and neglect. He taught the lad his letters out of Plutarch and the French 17th century romances in his shop, where the two remained reading at times all night until they saw the swallows flying low under the eaves. Such indulgence hardly contributed to stabilize a temperament essentially unbalanced and to the end Rousseau was to worship the heroic and the romantic. He received very little regular training and ideas of rigorous discipline remained foreign to his life and thought, and we need not expect to find them in his later treatise on education. His father came into conflict with the authorities, and later married a second time, and there followed a period when the lad seems to have been left to shift pretty much for himself. For a little while he, with a cousin, was sent to a school in the country, kept by a retired pastor, and later apprenticed to an engraver where he was left largely to his master and his fate and where he learned the petty tricks and villainies of maltreated apprentices generally. On this whole period of his early life it is unwise to accept the ‘Confessions,’ our largest single source of information. Most of the facts there recounted are substantially correct and it is dangerous to assume, as has been done by Faguet and others, that he frequently misrepresented. It must be remembered that this eloquent autobiography was written half a century later when the author's mind had been unsettled by real or imaginary persecutions and when he believed himself in disgrace with fortune and men's eyes. For this reason, though he recounts and excuses the sordid events of his early youth, he looked back upon his childhood as a refuge, the first asylum of his innocence, and idealized his relations to his city, his father and his relatives, and theirs to him. That his boyhood in Geneva was spent in relative isolation and unhappiness will be plain to the student who ponders the significance of that event which is usually emphasized as the turning point of his life.

When 16 years old, he hurried back one Sunday from his walk in the country to see the city gates closed in his face. Up to this point there had been nothing in his story to indicate the rover or vagabond, nor any desire to «see the world,» nor any unusual chafing under the restraints of his apprenticeship. That, however, there could not have been any bonds of affection to hold him to anything or anyone within the gates of his native city is plain from his course. An untrained apprentice, absolutely without means, and as yet with no ulterior purpose or desire, he decides forthwith that he will not enter the home of his youth again, and he wanders about aimlessly in the environs. The parting caused no serious heart burnings, either to himself or to his father and relatives, and for the next quarter century he merely «stopped off» at Geneva once or twice in a most casual way. The varied life of vagabonding, study, desultory occupations and adventures of the next 20 years it is impossible to describe in brief or general terms. His two most important relationships were those formed with Mme. de Warens and with Diderot, toward the beginning and the end respectively of this long period in the maturing of his genius. The former, an over-generous woman of purse and person, received him at her home where in the course of years he was in turn guest, protégé, lover and intendant. From her he received perhaps his first lessons in gentility and while at her house developed an interest in music of which he was to become one of the great 18th century masters. There, too, especially at her country home, Les Charmettes, near Chambery in Savoy, he began his first serious reading and study. In the intervals between his sojourns with Mme. de Warens and after his departure from her home he made many long trips, usually afoot, tried many desultory means of support, had many adventures and naturally saw much of the under side of 18th century society, which seems never to have seriously attracted him and against which he later sincerely if ostentatiously revolted. In 1743 he accompanied the French Ambassador to Venice and first came into close contact with political life and institutions. After his return to Paris (1744), he became more intimate with Diderot, who probably quickened his interest in philosophical and social problems, though Rousseau at this time was still primarily a composer, poet and musician. He lived with a dull and unattractive servant, Thérèse Le Vasseur, by whom he had five children whom he consigned to a foundling's asylum. One day in 1749 on his way to visit Diderot, who was at the time confined at Vincennes because of his ‹Letter on the Blind,› he had that strange experience which was to inaugurate his amazing career as man of letters and reformer and beget his first epoch-making work. This contains in germ the ideas which he later softened and amplified and provides the best starting point for the study of his philosophy.

Before considering it in detail certain general considerations must be borne in mind. The greatness of Rousseau is due to the fact that his work marks the end of one era and the beginning of another. We may admit, as recent studies have shown, that the isolated elements, the *disjecta membra* of his philosophy, are to be found in predecessors and contemporaries. It is none the less true that he marks the end of classicism in literature and of mediæval theories of the rights of empire and church in politics and religion. He tended to break the hold of all external sanctions in state, church, literature and society. His attitude toward the past is in general that of the modern radical. He starts on the other hand that immense enthusiasm for individual liberty and emotional participation in life which is to be the most characteristic feature of romanticism. He will exalt freedom as against any externally constituted authority; natural impulse as against discipline, and the individual's feeling (which he was often to identify with conscience) as against any convention of society. Phases of this spirit were to exert extraordinary influence in Germany on Herder, Schiller and Kant, and in England on men like Godwin and Wordsworth, while in France its first powerful expression is to be found in the destructive enthusiasm of the Revolution. Such an attitude was essentially dynamic in an age that clamored for new principles, though it was weak on the constructive side, for it lacked elements of cohesion, and it was fraught with danger wherever, as only too often, it made the individual and not mankind the point of reference in all human relationships and actions. For all its dangers, however, it is hardly too much to say that this attitude was the most powerful regenerative force of the late 18th and 19th centuries. It is as contributory to this general body of doctrine that each of Rousseau's works should be judged if we are properly to gauge its historical importance. We have seen that by temperament and experience he was already peculiarly fitted to become its champion. He was essentially the *novus homo,* the man without attachments, who was as strange to the highly socialized life of 18th century Paris as a man from Mars. By temperament he was averse to discipline and control. The circumstances of his life had not as yet, indeed were never, to force either upon him. He had from a boy been at home in nature and was ever to feel awkward and constrained in society. His posture was, therefore, one of attack and he had been endowed with an extraordinary and as yet untried gift of eloquence.

Upon his way to Vincennes his eye fell upon an announcement that the Academy of Dijon was offering a prize for the best discourse on the subject whether the arts and sciences have contributed to improve morals. Putting the question thus sharply before him seems to have released all of his pent-up social antagonisms and as he tells the story he fell in a trance and began to write feverishly at his first famous essay. Naturally he answered the question with a ringing negative. The development of the arts and sciences, he said, not only did not improve man in habits and morals, but he implied that with their progress man deteriorated. Society corrupted man's native goodness. The discourse is naturally full of inconsistencies and it is less well written than its successors. Its importance, however, lies in its purport. It is this that makes it the harbinger of a new dispensation, for it presents society and existing institutions as the perverters of mankind. In other words it throws them upon the defensive and inaugurates the age of experiment and reform. His next discourse on ‹The Origin of Inequality (1753) is a much better if less striking performance and in it he distinguishes between natural and unnatural or social inequality. Its upshot very briefly is that the former,—inequalities of talent, natural endowment, etc.,—are good and should be fostered, while the latter,—inequalities of social position, rank, inherited wealth, etc.,—are evil,



JEAN JACQUES ROUSSEAU

go back to the institution of private property and should be abolished. For some time before 1750 Rousseau had been living in a position of relative comfort and had been received in the houses of the great. Possibly as the result of illness and from a desire for notoriety as well as from a constitutional inability to accept restraint, he decided to «reform» and live the simple life. He made no attempt to recover his wardrobe, which had been stolen, gave away his watch and sword and dressed in simple garb. In 1756 he retired to a cottage near the forest of Montmorency. Here he broke with most of his old friends, including Diderot and his patroness, Mme. d'Epinay. In this quiet neighborhood he pondered and wrote during the next six years his three great masterpieces, ‹The New Heloise,› ‹Emile› and ‹The Social Contract,› which were published in 1761 and 1762. His misfortunes now increased with his fame and the remainder of his life is a tragedy clouded certainly by fixed delusions, possibly by periods of insanity. The ‹Emile› was condemned in Paris and a decree pronounced against Rousseau which forced him to leave France for Switzerland. Geneva was no more tolerant and he suffered from real or imaginary persecutions or both, and moves from place to place in a mood that approaches distraction. He is consumed by the desire to justify himself and confute his enemies and his later works, ‹The Letters to M. de Malesherbes,› ‹The Confessions,› ‹Rousseau Judge of Jean-Jacques› and the ‹Reveries› are devoted to this end. David Hume, who respected his genius, invited him to England, but here his delusions followed him and he accused his benefactor of conspiring with his enemies. He returned to France, where he lived for a time in disguise, and finally with Thérèse, whom he had now married, he comes back to live in Paris (1770) until his death at Ermenonville (1778).

We have spoken in passing of the general spirit of his work and of its importance. Its general principles may roughly be stated as follows: God is good, nature is good, man is good. The great governing forces of the world make for righteousness and virtue. Evil, therefore, is not natural or fundamental, it is the result of perversion. Rousseau found its sources in the human institutions which have produced society and have begotten ambition. His problem was, therefore, not so much to master or counter its possible effects as it was to eliminate evil altogether and prevent its irruption into a world of whose complex it is not an essential element. It is here that he links up with the Utopians of whatever age or clime. This being the case, Rousseau's insistence is not upon discipline and control. On every side, individual, social, educational, political, he believes in expression rather than repression. His ideal government is that which least checks the impulse and desire of the individual and gives him the maximum of direct control in all State affairs. His ideal system of education is that one which least hampers the development of the pupil's native bent. His ideal social life is that which ignores convention and allows all characters, even of contradictory interests, to live in one hive of harmonious virtues. For this reason his novel, ‹The New Heloise,› instead of being the tragic story of two men who love the same woman, is a wonderful but impossible idyll. Unrestrained self-revelation is exemplified in the ‹Confessions,› one of the most wonderful autobiographies in literature, and all told, probably his most valuable permanent contributions to pure literature. It remains not only a masterpiece of proud apologetics for a sorry and unhappy life, but the one indispensable document for him who would understand this strange sick genius who held so firmly and preached so eloquently his belief in the goodness of God, of nature and himself. It was this subjectivity of his, this individualism, this willingness to indulge in lyric expressions of his own griefs and joys that furnished a glowing precedent for that «pageantry of the bleeding heart» which was one of his greatest legacies to the later romanticists. His title as father of romanticism is further justified by his magnificent descriptions and glorifications of nature. Indeed in this respect the famous lines of Wordsworth,

> " One impulse from a vernal wood
> May teach you more of man
> Of moral evil and of good
> Than all the sages can."

are merely a later poetic restatement of the doctrine of this Genevan philosopher and man of letters. See CONFESSIONS, LES; EMILE; LA NOUVELLE HELOISE; SOCIAL CONTRACT.

The best complete edition of Rousseau's works in French is still that of Musset-Pathay (1823–26). John Morley's ‹Rousseau› remains in spite of its inadequacy, especially on the biographical side, the most important study of the man in English. Frederika McDonald's ‹J. J. Rousseau› (2 vols.) is a well-intentioned but occasionally uncritical attempt to justify Rousseau against his enemies and gives irrefutable evidence of the plot of misrepresentation. The important results of the recent attacks on Rousseau have been incorporated in Irving Babbitt's ‹Rousseau and Romanticism› (1919), an able indictment rather than an open-minded criticism. Many of the important recent studies themselves and the results of all appear in the volumes annually published by the Rousseau Society of Geneva, ‹Annales J. J. Rousseau,› which contains complete bibliographies. Of the longer recent works consult Ducros, ‹J. J. Rousseau, de Genève a l'Hermitage› (1908); Vallette, ‹J. J. Rousseau, Genévois› (1911); Faguet, ‹Vie de Rousseau› (1911); Lemaître, ‹J. J. Rousseau› (1907); Mornet, ‹Le sentiment de la Nature en France de J. J. Rousseau à Bernardin de St. Pierre› (1907). On Rousseau's philosophy consult *Revue de Metaphysique et de Morale* (Vol. XX).

CHRISTIAN GAUSS,
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**ROUSSEAU, Lovell Harrison,** American soldier and legislator: b. Stanford, Ky., 4 Aug. 1818; d. New Orleans, 7 Jan. 1869. He was admitted to the bar in 1841, engaged in practice at Bloomfield, Ind., and was a member of the Indiana legislature 1844–45. He served in the Mexican War and in 1849 opened a law office in Kentucky, and became famous as a criminal lawyer. In 1860 he entered the Kentucky senate, but resigned to join the Union army. He was commissioned brigadier-general of volunteers in 1861, promoted major-general in 1862, and fought at Stone River, Chickamauga and Chattanooga. From 1863–65 he was as in command of the district of Tennessee and successfully defended Fort Rosecrans during the siege of Nashville. He took his seat in Congress in 1865, but in the following year resigned it in consequence of being reprimanded by that body for a public assault upon Representative Grinnell of Iowa. He was, however, soon re-elected and served another year. In 1867 he was appointed brigadier-general in the regular army and assigned officially to receive Alaska from Russia and assume control of the territory. He was summoned from this post to testify in the trial for impeachment of President Johnson and was afterward until his death in command of the Department of the Gulf with headquarters at New Orleans.

**ROUSSEAU, Philippe,** French artist: b. Paris, 1816; d. Acquigny, 4 Dec. 1887. He studied under Gros, Bertin and Hippolyte Garneray, and first exhibited at the Salon in 1831. His early work was confined principally to landscapes; but he later painted animals, excelling in his pictures of monkeys, and also painted interiors, fruits and flowers with excellent color and light effects and rare taste for beauty. Among his works are ‹The City Rat and the Field Rat› (Medal, Salon, 1845); ‹Interior of a Farmhouse› (1850); ‹Storks Taking a Siesta› (Luxembourg Museum); ‹Breakfast› (Valenciennes Museum); ‹Spring› (1869); ‹The Wolf and the Lamb› (1875), etc.

**ROUSSEAU, Pierre Etienne Théodore,** French painter: b. Paris, 15 April 1812; d. Barbizon, near Fontainebleau, 22 Dec. 1867. He was a pupil of Rémond (1826) and of Lethière, but quickly parted company with all current theories of art, and showed himself an original interpreter of nature, while he fought the battle of the new landscape—«paysage intime»—through the 13 years during which his pictures were excluded from the Salon by the Academical Jury, which happily has since then been abolished. He traveled through the Auvergne and Normandy and painted the scenery with the main object of breathing human feeling into the colors and forms of external nature. He is the central figure of the Barbizon school and must be looked upon as the founder of the modern school of French landscape painting, as opposed to the Romanticism of Claude Lorraine, Poussin and their followers. It has been well said of him: «He occupied the highest place because he was the most perfect master. The grand aspect of landscape and its tenderness are equally familiar to him. He renders with the same mastery the smile of creation and its terrors; the broad open plain and the mysterious forest; the limpid, sun-bright sky or the heaping of the clouds put to flight by storms; the terrible aspects of landscapes or those replete with grace. He has understood all, rendered all, with equal genius. The greatest contemporary painters have each a particular stamp, Corot painting the grace; Millet, the hidden voice; Jules Dupré, the majestic strength. Théodore Rousseau has been by turns as much a poet as Corot, as melancholy as Millet, as awful as Dupré; he is the most complete, for he embraces landscape art absolutely.»

In 1848 he took up his residence on the edge of the forest of Fontainebleau and derived most of his inspiration from the surrounding scenery. How he drew the motif of his work from this environment is seen in the fine picture in the Metropolitan Museum, New York, ‹Edge of the Woods.› Among other characteristic works may be mentioned ‹View of the Valley of Paris and the Banks of the Seine›; ‹The Forest Height of Compiègne› (1833); ‹Avenue of Isle-Adam›; ‹Entrance to the Forest of Fontainebleau› (1862); and ‹Marsh in the Landes› (1854); the last two being in the Louvre. His early style was sketchy with some carelessness of touch, although absolutely sincere and impressionalistic. Later he indulged in excessive detail, and never seemed to know when his pictures were finished, yet all his landscapes were tinged with the deepest poetic spirit. He never really won recognition during his lifetime, however, and after an unsuccessful auction-sale of his works in 1861 thought seriously of seeking a home in some foreign capital. It is said that a sense of this depreciation wore away his health. Yet in the last year of his life he took the medal of honor and since his death the genuine merit of his pictures has been acknowledged and as early as 1873 his ‹Scene near Fontainebleau› was sold for $2,360. Consult Sensier, ‹Souvenir sur Théodore Rousseau› (Paris 1872).

**ROUSSEAU'S CONFESSIONS.** Jean-Jacques Rousseau. For us, who lived among scientific ideas familiarly applied, the name of Rousseau has lost its power to shock. Most of us have forgotten that to the eyes of the 18th century mankind appeared in the image of his maker, without body, parts or passions, and that to Rousseau belonged the discovery of man as he really is, with his structure as an animal, with his power as an idealist, with his limitations as a machine. The ‹Confessions› must, therefore, be read, first of all in order that we may appreciate the effect of this discovery upon a society whose view of its own members had tended, until Rousseau appeared, to be distorted and sentimental. Secondly, it should be read because this presentation of a human being who felt himself to be different from other men became the starting-point for our own understanding of such human beings, and our belief in educating each according to his individual need. Lastly, it must be read because every school child in America owes much of the intelligent care of his training to the works of that unhappy, morbidly hypersensitive, little thief and coward of a Jean-Jacques. The service of truth is the service of God, and thus the impression which these often ugly ‹Confessions› made on thoughtful people was almost a religious impression. George Eliot, for example, speaks of their effect on herself as crucial. Anyone who looks into the depths of his own nature, as Rousseau did, may see the same scurry of ill-formed wishes seeking cover in darkness, and tremble to think how close he is to the brute. But this book is not only a record of morbid feelings: it is also an account of a man's struggle with social injustice, told with emotional power, with a feeling for beauty and for nature, which heightened his style above the great accents of his time. This struggle continues; it has changed and is yet changing the face of the world. Rousseau has taught us all to feel sympathy for the individual who needs special training. The facts he gave about himself have become the classic material of modern educators. He describes an early life spent in miserable servitude to unworthy masters, lacking in health, self-confidence, equal friendships or steadfast purpose. The son of a Swiss watch-maker, he drifted about from situation to situation, never secure in his patron's favor, and sick with rage at owing each advance in life to some base caprice or to his own servile weakness. His intense egotism became his only refuge, while faith in his own powers ultimately raised him above his vices. None of his critics has been more severe than he; and he knew that there was nothing in his circumstances to help him overcome his nervous tension, his irritable sensitiveness. All these things he set down with close detail and unexampled beauty of language, describing the play of life upon his nerves and imagination, his conflicts, his errors, his rise to literary power. Although no translation of the ‹Confessions› exists which does it full justice, yet no book has had more influence on English literature, and its value deepens with the advance of psychology. Surely, it was his own individual struggle which lent such poignant emotion to that famous sentence of the Social Contract —«Man is born free, yet everywhere he is in chains.» It was his personal experience of that civilization which he felt was wrongly leading men away from nature, which caused his books to become the inspiration and his voice the trumpet call of modern democracy. We of to-day must, therefore, feel that Rousseau's delight in the beauty and dignity of Nature, his faith in the essential beauty and dignity of human life, draw him closer to us and serve to outweigh the dark and morbid moments of his narrative. Much of the smiling and liberal aspect which life to-day wears for any ambitious youth has been gained for him by the work of this unhappy man, who never relinquished or denied an ideal because he often fell so pitifully short of it. With a lacquey's vices and from a lacquey's condition, he yet managed to raise himself to a throne in the kingdom of ideas. Because he lived, the life of the young is happier than it was, and this fact should give pause to those who are shocked by his candor. Lord Morley is one of these, and Mr. Birrell thinks the ‹Confessions› ought never to have been written, «but written they were,» he adds, «and read they always will be.» To say that a book will always be read seems to us a high form of praise; but surely the ‹Confessions› need no justification. When we turn to the history of our own country, we hear the voice of Rousseau urging on the founders of the Republic: and it has even been said that Rousseau, by inspiring Jefferson, is the real author of the Declaration of Independence. The life, by himself, of one whose ideas yet live in that Declaration and in the schools of the world, is full of interest, an interest heightened because we now believe, with Jean-Jacques, that each of us is «different,» and that those of us who are healthy, vigorous, living in the light, may be benefited by knowledge of the others, who — generally through no fault of their own — are frail, abnormal, living under the shadow of mental or moral infirmity.

Anna Robeson Burr.

**ROUSSEL**, roo'sĕl, **Gérard**, French bishop and reformer: b. Vaquerie, near Amiens, about 1480; d. Mauléon, 1550. He studied at Paris, became a friend of Lefèvre d'Étaples, and shared his exile when his theories of Reformation were the cause of his being driven to seek safety at Meaux in 1521. Later Roussel was himself compelled to flee to Strassburg to avoid imprisonment on a charge of heresy; but in 1526 he was recalled by Francis I and became court preacher to Margaret of Orleans. After her marriage to the king of Navarre in 1527 he became her confessor, and in 1536 he was appointed bishop of Oléron. While a believer in reformation he held it not incompatible with continued connection with the Roman Church and under the protection of his patroness he occupied a sort of intermediary position between the Reformation and Rome, although his writings and preaching were twice condemned by the Sorbonne. While preaching a sermon advocating a reduction in the number of church festivals he was attacked by fanatics and received injuries from which he died. Author of ‹Expositions›; and a number of tracts and translations. Consult Schmidt, C., ‹Gérard Roussel› (1845).

**ROUSSELOT**, roo-sĕ-lō, Abbé **Jean Pierre**, French phonetician: b. Saint-Cloud, Charente, 1846. He was early engaged in teaching and as a curate and vicar, but studied at the University of Paris and took his degree in letters in 1892. He was appointed assistant professor of French philology at the Catholic Institute, Paris, in 1887; and established there the first course in experimental phonetics. He planned the laboratory of experimental phonetics at the Collège de France and became its director in 1897. He invented a number of valuable phonetic instruments and methods to aid the deaf and to correct impediments in speech. He edited *Revue des patois Gallo-Romans* in 1887–93. Author of ‹Principes de phonétique experimentale› (1897); ‹Précis de prononciation française› (1902), etc.

**ROUTH, Edward John,** British mathematician: b. Quebec, Canada, 28 Jan. 1831; d. Cambridge, England, 7 June 1907. He went to England at the age of 11, was educated at University College, London, and at Cambridge, and was elected a Fellow at Peterhouse, Cambridge, in 1857. He was a famous mathematical tutor, 500 out of his 700 pupils becoming wranglers; while for 22 consecutive years, 1861–82, the senior wrangler was trained by him. He was an examiner at both University College, London, and at Cambridge. With Lord Broughton he wrote ‹An Analytical View of Newton's Principia› (1855). He was also author of ‹Essay on the Stability of a Given State of Motion› (Adam's Prize, 1877); ‹Treatise on Rigid Dynamics› (2 vols., 1860; 7th ed., 1905); ‹Treatise on Analytical Statics› (2 vols., 1891; 2d ed., 1896–1902); ‹Dynamics of a Particle› (1898), etc.

**ROUTHIER**, roo'tyā,' Sir **Adolphe Basile,** Canadian jurist and author: b. Saint Placide, Quebec, 8 May 1839. He was educated at Laval University and was called to the bar in 1861.

He became queen's counsel in 1872; was appointed judge of the Superior Court for Quebec in 1873 and was named chief justice in 1904. He was also judge of the Vice-Admiralty Court of Quebec from 1897 until his retirement from the bench in 1906. He was knighted in 1911. He was known as a writer of essays, verse and travels. Author of the Canadian national song 'O Canada'; 'A Travers l'Europe'; 'A Travers l'Espagne'; 'Les Echoes' verse; 'Le Centurion,' novel; 'De l'Homme Dieu,' apology for Christianism, etc.

**ROUTLEDGE,** rout'lĕj, **George,** English publisher: b. Brampton, Cumberland, 23 Sept. 1812; d. London, 13 Dec. 1888. He established himself as a bookseller in London in 1836 and as a publisher in 1843. His house became famous for its pioneer work in the publication of good books in cheap editions; his «Railway Library» selling at a shilling and presenting the works of Washington Irving, Fenimore Cooper, Bulwer Lytton and Benjamin Disraeli. Harriet Beecher Stowe's 'Uncle Tom's Cabin' was included in this series and sold more than 500,000 copies. Routledge's «Universal Library,» edited by Henry Morley, also sold at a shilling a volume. The firm name, originally Routledge, Warne and Routledge, later became George Routledge and Sons. Its New York branch was established in 1854.

**ROUVIER,** roo'vyā, **Maurice,** French statesman: b. Aix, 17 April 1842; d. 7 June 1911. He was educated for the law but engaged in business at Marseilles and in 1870 founded the anti-imperialist paper *L'Égalité.* He was elected to the Chamber of Deputies in 1871 and became a recognized authority on finance. He was Minister of Commerce and the Colonies in the Gambetta Cabinet in 1881–82, and filled that post in the Ferry Cabinet in 1883–85. He was Premier and Minister of Finance in 1887, but his Cabinet fell through its attempt to shield President Grévy in the scandal connected with the barter in the decorations of the Legion of Honor. He was Minister of Finance in the Tirard, Freycinet, Loubet and Ribot cabinets. The Panama scandals in 1892 involved his office and he was compelled to retire, but he was reinstated in the Combes Cabinet in 1902. In 1905 he became Premier for the second time, and during the Moroccan crisis with Germany he took over the portfolio of Foreign Affairs. The Separation Law was enacted in his administration, putting into effect Rouvier's long fought-for separation of church and state, but his ministry did not long survive it, and in 1906 he was succeeded by the Sarrien Cabinet.

**ROUX,** roo, **Pierre Paul Emil,** French physician and bacteriologist: b. Confolens, Charente, 17 Dec. 1853. He was educated at the School of Medicine at Clermont-Ferraud and at the University of Paris. Since 1878 he has been connected with the Pasteur Institute, and has been director there since 1904. He assisted Pasteur in researches connected with the ætiology of carbon and the treatment of hydrophobia; is widely known for his work with diphtheria and the anti-diphtheria serum; was engaged with Nocard in researches resulting in the discovery of the pneumonia microbe; and likewise made researches into the nature and possibility of prevention and cure of tetanus, syphilis and other infectious diseases. He was elected to the Academy of Medicine in 1895, the Academy of Science in 1899 and in 1903 received the Osiris Prize of $20,000 from the Institute.

**ROVE-BEETLES,** or **COCKTAILS,** names applied to a tribe of beetles, the *Staphylinidæ,* characterized by elytra only about one-fourth of the length of the abdomen. A common species is the «Devil's Coach-horse» (*Goërius olens*), a fanciful name given to it from its diabolical aspect when it curls up the abdomen and opens its jaws. These beetles are carnivorous in habits, and are apt to bite if incautiously handled. The habit of cocking the tail has been alleged to have for its object the function of pushing the hinder wings under the short elytra, which are formed by the front wings and which protect the hinder or functional wings. These beetles fly about chiefly in the dusk and at night. The tarsi generally possess five joints.

**ROVUMA,** rō-voo'mä, a river of Africa, which rises east of and near Lake Nyassa, and flows east into the Indian Ocean. It forms the boundary between German East Africa and Portuguese East Africa. It is about 500 miles long. For about 80 miles from the mouth there are high lands along the banks and about 160 miles from the ocean are a number of beautiful cascades and waterfalls. The river is navigable for some distance. It was first explored by Livingstone in 1861.

**ROWAN,** row'ạn, **Andrew Summers,** American army officer: b. Gap Mills, Va., 23 April 1857. He was graduated from West Point in 1881, served on the frontier till 1890, when he was detailed on surveying duty in Central America as a member of Party No. 1 (Macomb's), and after the opening of the Spanish-American War in 1898 was sent to communicate with General Garcia. He made a landing from an open boat near Turquino Peak, Cuba, on 24 April 1898, and with much difficulty succeeded in reaching Garcia, obtained full information of the insurgent army, and made the return trip successfully, was the first American army officer to enter Cuba after the declaration of war. He was promoted lieutenant-colonel, United States army, for this service, and in 1899–1902 was on duty in the Viscayas Group, Philippine Islands. He was professor of military science and tactics at the Kansas State Agricultural College, 1902–03. He retired in 1909. He has written 'The Island of Cuba' (1898). Was the subject of Elbert Hubbard's 'A Message to Garcia' He has been engaged in literary work since quitting the active list, and is now at work on a history of Mexico.

**ROWAN, Stephen Clegg,** American naval officer: b. near Dublin, Ireland, 25 Dec. 1808; d. Washington, D. C., 31 March 1890. He came to the United States when very young and in 1826 was appointed a midshipman in the navy, receiving promotion to lieutenant in 1837. He saw active service in the Mexican War and in 1855 he was appointed commander. At the outbreak of the Civil War he was in charge of the *Pawnee,* and on 25 May he engaged in the attack on the Confederate batteries at Acquia Creek, the first naval engagement of the war. He assisted in the capture of Fort Hatteras, and was promoted captain and commodore for his services. He was engaged at Roanoke Island and Albemarle Sound, and later captured Fort Mason, thereby restoring National authority in North Carolina. He was in command of the *New Ironsides* at forts Wagner, Gregg and Moultrie, received the thanks of Congress, and in 1866 was promoted rear-admiral. He became vice-admiral in 1870, and from 1883 until his retirement in 1889 was chariman of the lighthouse board.

**ROWBOTHAM,** rō'bŏt-ạm, **John Frederick,** English Anglican clergyman, poet and historian: b. Bradford, Yorkshire, 18 April 1859. He was educated at Oxford, traveled extensively on the Continent, and took orders in the Church of England in 1891. He was vicar of Ratley in 1892, rector of Huntley in 1895, British chaplain of Budapest and Hungary in 1896, and vicar of Abbotsley 1897–1900. He has published ‹The History of Music› (3 vols., 1887); ‹Poetical Works› (1889–90); ‹The History of the Troubadours and the Courts of Love› (1895); ‹The God Horus, a Novel of Ancient Egypt› (1898); ‹The Human Epic› (1902), etc.

**ROWE,** rō, **George Fawcett,** English-American actor: b. Exeter, about 1829; d. New York, 29 Aug. 1889. He made his first appearance on the stage in Australia in 1854; toured through India, China and Peru, and appeared in New York in 1866 under Mrs. John Wood's management at the Olympic. His most famous part was Wilkins Micawber in Halliday's dramatization of ‹David Copperfield.› He also played Silas Wegg in ‹Our Mutual Friend,› and many other comic and farcical parts, some in pieces of his own composition, such as ‹Brass›; ‹The Geneva Cross›; ‹Found Drowned›; and ‹The Sleigh Bells.› His last appearance was at the Colosseum Theatre, London, as Rufus Potts in ‹Forward to the Front,› 27 April 1889.

**ROWE, Leo Stanton,** American economist: b. McGregor, Iowa, 17 Sept. 1871. He was graduated at the University of Pennsylvania in 1890, and took his Ph.D. at Halle in 1892. He was admitted to the bar, and in 1895 became a member of the faculty at the University of Pennsylvania, where since 1904 he has been head professor of political science. He was in 1900–01 a member of the Commission to Revise and Compile the Laws of Porto Rico; and in 1901–02 was chairman of the Insular Code Commission. He was secretary-general of the Panama-American Financial Conference and of the International High Commission at Washington, D. C., in 1915; and in 1917 was appointed Assistant Secretary of the Treasury. He was joint author of ‹Report of the United States Commission to Revise the Laws of Porto Rico› (2 vols., 1901); ‹Report of the Insular Code Commission› (8 vols., 1902); and author of ‹The United States and Porto Rico› (1904); ‹Problems of City Government› (1908), etc.

**ROWE, Nicholas,** English dramatic poet: b. Little Barford, Bedfordshire, 1674; d. 6 Dec. 1718. He studied at Westminster, entered as a student at the Middle Temple, but turned his chief attention to literature. At 24 he produced his tragedy of the ‹Ambitious Stepmother›; ‹Tamerlane› followed in 1702. His next dramatic performance was the ‹Fair Penitent,› remodeled from the ‹Fatal Dowry› of Massinger. In 1704 he wrote ‹The Biter,› a comedy, which being a failure, he thereafter kept to his own line, and from that time to 1715 produced his ‹Ulysses,› ‹Royal Convert,› ‹Jane Shore› and ‹Lady Jane Grey.› On the accession of George I in 1715 he was made poet-laureate. He wrote a few tender and pathetic ballads, translated Lucan's ‹Pharsalia,› and edited the plays of Shakespeare (1709). The memoir prefixed to the plays contains much traditional matter judiciously presented.

**ROWELL,** rōw'ĕl, **Newton Wesley,** Canadian lawyer and statesman: b. Middlesex County, Ontario, 1 Nov. 1867. He was educated in the public schools and at the Ontario Law Society; was called to the bar in 1891, and in 1902 became king's counsel. He attained a reputation as a leader of the Ontario bar; and in 1911 was elected to the Ontario legislature, where he became the leader of the Liberal Opposition. He is an earnest worker for legislation to improve social conditions, particularly factory laws, workmen's compensation, shorter hours of work for women and children, and to problems of housing, taxation and temperance reform. He was president of the Privy Council of Canada in 1917; and a member of the Imperial War Council in 1918.

**ROWING,** the propelling of floating rafts, boats or barges by means of oars, is the most ancient of all methods of traveling by water. As evidenced by some of the oldest Egyptian carvings rowing was a well-established practice before history began to be written and remained the chief mode of propelling even of war craft of considerable size long after the art of sailing was invented. Three hundred years before Columbus discovered America the watermen of the Thames were linking the art of rowing inseparably with the sterner history of England in transporting the barons to Runnymede in 1215 to witness the signing of Magna Charta in boats and barges propelled by oars.

Just when rowing began to commend itself to the attention of gentlemen of leisure as a new outdoor sport is not a matter of record. However, it appears that in 1715 an English actor, Thomas Doggett by name, instituted a boat race among the watermen of the Thames, offering as a prize a waterman's coat with a conspicuous silver badge upon the arm. The occasion was so great a success that he established a fund to provide in perpetuity the prize for the annual celebration of such a contest, which is known to this day as the «Doggett's Coat and Badge Race,» from the reward of the successful boatman. Following the initiative of Doggett the practice became general of organizing boat races between the Thames watermen, and there was no lack of sportsmen to contribute prizes as incentives to vigorous contests.

The introduction of the Venetian Regatta, first conducted on the Thames in 1775, added enormously to the popular interest in water sports, and by the opening years of the 19th century rowing had become one of the standard athletic diversions of the people. Several boat clubs were in existence, and special racing boats for six-oared and eight-ored crews had been built. The names of the first four clubs, «Star,» «Arrow,» «Shark» and «Siren,» have been preserved in the annals of the time. The records show that in 1811 Eton had three 8-oared boats and one 10-oared boat; and that in 1813 Westminster School had a six-oared boat. In 1818 a challenge to race was sent by the Eton crew to the Westminster crew, but the authorities prevented the race. In 1829, however, the crews of these two schools rowed the first of a series of matches which spread irregularly over the period up to 1847. For 15 years these contests were abandoned, to be renewed for a brief period in 1862, the Westminster school then giving up their boating.

The first amateur races were between two rival picnic boats on the Thames in 1826. This became a favorite sport, and it became a common practice to enliven picnic parties on the river by improvising such boat races.

The first intercollegiate race was rowed at Henley in 1829, the Oxford crew winning from Cambridge. Oxford had begun rowing races among its own classes in 1815, and Cambridge took up the sport a year or two later. The second meet of these two colleges was not until seven years afterward, and from that time forward these races were held at irregular intervals until 1856, since which year the Oxford-Cambridge race has been an annual occasion, up to the outbreak of the War of 1914.

The Henley Royal Regatta was established by the town of Henley in 1839. The series of contests was open to all amateur crews in eight-oared boats and to any four-oared crews of the town. The first regatta comprised five races. This regatta is now held annually and is the greatest rowing event of the world. The course is one mile — 550 yards. The races are rowed against the stream, and the time is close to seven minutes.

**In America.**— The first college races in the United States were between boats owned by Yale students, in Boston Harbor in 1844, the contestants being an eight-oared gig and a dug-out canoe. The first intercollegiate race was rowed in eight-oared barges by Yale and Harvard crews in 1852, over a two-mile course on Lake Winnepesaukee. In 1855 the two colleges raced again over a three-mile course at Springfield, Mass. For nine years thereafter they rowed at Lake Quinsigamond and in 1869 at Lake Saltonstall. For the seven years following no Yale-Harvard races were contested, but in 1876 they were resumed on a four-mile course at Springfield. In 1877 they rowed again on this course, and since then the races have been rowed on the Thames River at New London, Conn., annually up to 1916. No races were made during 1917 and 1918 on account of the war. The fastest time ever made on this course was 20.02 minutes by Harvard, on 23 June 1916. In this race Yale's time was 20.17 minutes — beating the previous record of 20.20, made by the Yale crew 26 June 1902.

In 1859 the first intercollegiate regatta was held at Springfield, Mass., and from that time onward this meet was an annual event until 1875, when 13 colleges were represented. The racing boats of that period were six-oared shells. The adoption of the eight-oared boat and the four-mile course by Yale and Harvard, and their consequent withdrawal from the intercollegiate races put an end for the time being to these contests. They were revived, however, in 1900, when the new Intercollegiate Association formed in 1895 by Columbia, Cornell and Pennsylvania, selected the four-mile course at Poughkeepsie, N. Y. In this first of the new series of regattas crews of Pennsylvania, Wisconsin, Cornell, Columbia and Georgetown contested. Pennsylvania won in 19 minutes 44 3/5 seconds, the others finishing in the order named. In 1901 a crew from Syracuse University joined the other five, and Cornell won the race in 18 minutes 53 1/5 seconds, the fastest time ever made over this course. In 1907 Annapolis participated, and in 1912 Leland Stanford, Jr., University sent a crew.

The best time for four-oared crews made over two miles of the Poughkeepsie course was recorded for a Cornell crew in 1915 — 10 minutes 0 1/5 second.

No races were held by this association in 1917 and 1918 on account of the war. Yale and Pennsylvania raced with two crews each at Philadelphia and the regular regatta of the New England Amateur Rowing Association was held on the Charles River on the Fourth of July of that year, but a general suspension of the sport on account of the war marked the season of 1918. The sport was resumed in 1919. See SPORTS.

**ROWING, Technics of.** Rowing is the method of propelling a boat by the use of oars. It consists of two parts — the stroke and the recovery, which are executed by a series of complex motions designed to apply a maximum of available motive energy in urging the boat through the water, and at the same time ensure the least amount of deviation from a straight course.

In preparing to row the oarsman sits on the thwart, facing the stern and exactly opposite the handle of his oar, the shaft of which rests in the rowlock with the button on the inner side. To obtain the maximum effect from the power exerted he should sit about two inches from the after edge of the thwart, the body being held square and upright, the back straight and rigid, the feet pressed firmly against the opposite stretcher or foot board with the heels close together and the toes apart, so as to keep the knees separate. The handle of the oar should be held firmly by both hands which should be about three inches apart with the outside one close to the end of the handle, the

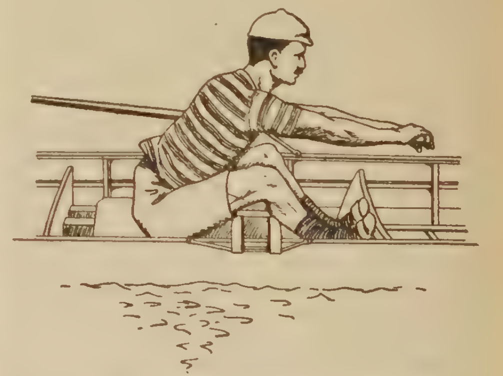
FIG. 1.— Position beginning of stroke.

fingers being above and the thumb underneath. The grasp should be a flexible hold with the fingers and not a clutch with the whole hand. The forearms should be kept below the level of the handle, with the elbows down, close to the sides of the body. The wrists should be relaxed and dropped, so that the blades of the oars will lie flat upon the surface of the water.

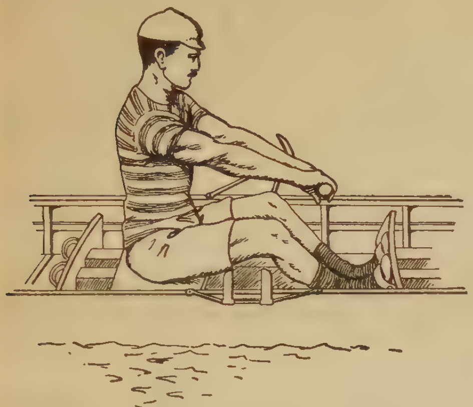

FIG. 2.—Position halfway through stroke.

The stroke is characterized by four distinct phases — the catch, the drive, the pulling through and the finish. The recovery which includes the shoot, the feather and the full reach. In taking the stroke, the body is inclined forward, the backbone being kept straight and rigid, the shoulders thrown forward and held up as high as possible, while the abdomen is kept well out and down between the legs. The arms should reach out perfectly straight from the shoulders to the wrists and the action of the shoulder joints and the hips should be perfectly free and easy. In reaching forward the oar handle is grasped firmly by the fingers, and the hands are shot out quickly straight from the body, and as soon as the oar has been passed over the knees, the wrists are raised so as to bring the blade at right angles to the surface of the water and preparatory to dipping it, at the beginning of the stroke when the arms reach the extreme limit of their forward movement directly over the stretcher. At this instant, the hands are raised and the blade is dropped firmly into the water and buried until it is covered up to the shoulder. The pull begins with the drive of the legs, a steady thrust of the feet strongly against the stretcher, the power being transmitted to the oars through the arms by the tense muscles of the rigid back. This leg action is the greatest power utilized in rowing, and the most should be made of it. The pull with the arms supplements the leg drive as the body sways backward. The finish of the stroke is achieved by the arms alone, and as the boat is at the moment at its greatest speed the movement is the quickest demanded in the stroke; the wrists are raised and the oar turned so that the blade slips instantly out of the water and into the position of feathering. During the entire stroke the arms should preserve, as nearly as may be, a right angle with the line of the oar, that position giving the largest leverage. The recovery begins immediately after the blade of the oar slips out of the water at the finish of the stroke. The object is to get the oar back into its first position in readiness for another catch. This position is termed the full reach. During the recovery several things have to be taken care of. For one thing the boat must be preserved upon an even keel; partly by the feathering of the oar along the surface of the water, but mainly and preferably by the grasp of the feet upon the toe-straps on the stretcher board. The movement is complicated in the case of the sliding seat. Assuming this to be in use, the leg-drive has thrust the seat back at the beginning of the stroke, before the arms begin to do their particular share. In the recovery the seat must be brought back to its first position. But, as the arms made the last movement in finishing the stroke, so in the recovery they make the first move in the shoot. This motion is very quick. The body necessarily moves much slower, and it must swing over from the bend backward to the bend forward. During this swing of the body the sliding seat must be returned to its first position. It is necessary that these two latter movements be made gently in order that the inertia of the moving boat be not checked by a jerking force in the contrary direction. By gently is not meant slowly: in fact the movements must be made as swiftly as possible. When skilfully done the sensation to the rower is that he has simply permitted the boat to glide forward under him. The very last part of the recovery is the full reach, accom-

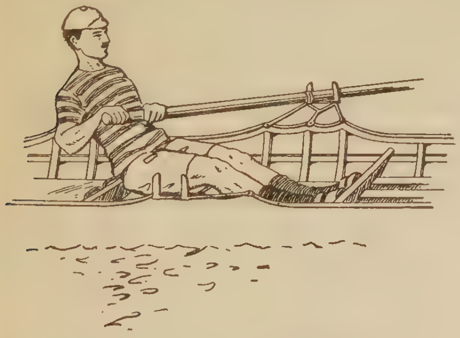

FIG. 3. — Position finishing of stroke.

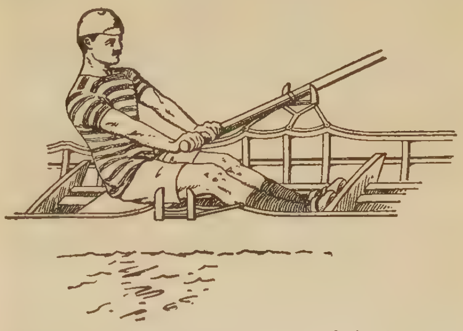

FIG. 4.—The "Recovery." (Position of the hands and wrists in the act of feathering).

plished by thrusting both shoulders forward like the wings of a hinge, with the rigid backbone as the centre. The instant the full reach is attained the oar should go into the water for the next catch. It is a serious fault to «hang» momentarily at the reach before taking the catch.

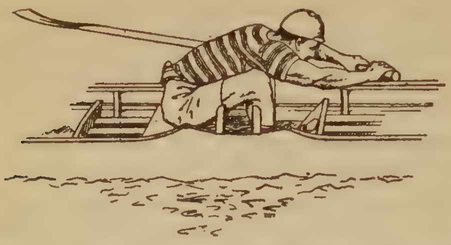

FIG. 5.—A common but very bad position. (Beginning of stroke).

The motion of the body should be as constant, smooth and steady as that of a pendulum, while the action of the hands and the wrists, producing the dipping and the feathering, should be entirely free from jerks. When the boat contains a number of oarsmen, each one keeps his eyes on the back of the oarsman in front of him, and times his swing from him; or in other words «keeps eyes in the boat.»

A boat is «held» or has its headway stopped, by laying the blade flat and then sinking its forward edge slightly into the water. The blade is thus buried at an acute angle and checks the way of the boat gradually until it has been sufficiently reduced to allow of the blade being reversed square, to «back water.» If the boat is under much headway, any attempt to back water before it has been held would be attended with disastrous results, as the resistance would prove greater than the strength of the oars and cause a fracture.

In sculling, a scull or oar is held in each hand, instead of one oar handle being held in both hands, as in rowing. The grip on the scull is governed by the rules applicable to the grip on the oar handle in rowing, but with the exception that the thumb should cap the butt of the scull handle with the top joint and not clasp around it. The action of the body, legs, arms, wrists and hands are also the same as in rowing, but in sculling some advantage may be gained by allowing the body to swing farther back at the finish of each stroke. Both hands should work together, and both blades should enter and leave the water at the same time. Up to 1856 racing boats were clinker-built; the smooth skin boat was then introduced, and in 1857 was generally adopted as somewhat faster. The sliding seat invented in America by Walter Brown, in 1869, was used by the Yale crew in its race with Harvard in 1870, and Yale won. It was used at Henley for the first in 1872, and in 1873 was instrumental in cutting the time on the 4¼ mile course by half a minute. The changes since then have been few. It was at one time believed that shortening the boat would make it speedier, and the dimensions of the 8-oared boat were changed from 63 feet in length and 16 inches in width, to 58 feet in length and 20 inches in width. No appreciable gain was secured; although the shorter boat was faster with some crews, the longer was faster with others. For the single sculler, however, the short boat proved unquestionably faster. As now in use the oars are 12 feet 1 inch to 12 feet 6 inches in length, and the blades vary from 5½ to 7½ inches in width; the short oars having the wider blades. In America, as a rule, the long oar with the narrower blade is preferred. The slide of the seat varies from 12 to 17 inches, although up to 20 inches is allowed, depending upon the individuality of the oarsman. It has been definitely proved that if the body bends too far backward it is impossible to recover quickly, and that the muscles of the back quickly show fatigue. With the longer slide the back need not incline so far. While formerly the swaying of the bodies of the men in the crew was carefully synchronized, it is now recognized that this is of little importance so long as the action of the oars in the water is symmetrical and exact; and far more freedom is permitted to the individual in body movement so long as his work at the blade of the oar is accurately timed. Consult Stevens, A. W., ‹Practical Rowing› (Boston 1906); Warre, E., ‹On the Grammar of Rowing› (Oxford 1909).

**ROWLAND**, rō'land, **Henry Augustus**, American scientist: b. Honesdale, Pa., 27 Nov. 1848; d. Baltimore, Md., 16 April 1901. He was graduated from the Rensselaer Polytechnic Institute in 1870, and taught for a year in Wooster College, Ohio, but in 1872 returned to the Institute, where he was instructor in physics, becoming assistant professor in 1874. He studied for a time in Germany, and in 1876 accepted the chair of physics at Johns Hopkins University, which he occupied until his death. He was a member of the Electrical Commission in Paris in 1881, and was elected to the National Academy of Science in that year. He was the inventor of a greatly improved process of ruling large diffraction gratings directly on concave mirrors, constituting what is known as the dividing engine (q.v.), with which he succeeded in making photographs far superior to any which had then been made. He made numerous valuable investigations and experiments, particularly in electricity, among them an extremely accurate determination of the ohm, a work which he afterward extended under the government. He was author of more than 100 scientific papers and monographs, among which are ‹Magnetic Permeability› (1873); ‹Magnetic Effect of Electric Connection› (1876); ‹Research on the Absolute Unit of Electrical Resistance› (1878); ‹On the Mechanical Equivalent of Heat› (1880); ‹Photographs of the Normal Solar Spectrum› (seven plates, 1886), etc.

**ROWLANDITE.** A rare yttrium mineral $2Yt_2O_3.3SiO_2$ occurring in small quantities at Baringer Hill, Llano County, Tex.

**ROWLANDS, Samuel**, English satirist and poet: b. about 1570; d. about 1630. He wrote numerous pamphlets in both prose and verse, many of them of a religious order and others keenly satirizing the social conditions of his day. His first pamphlet, ‹The Betraying of Christ› (1598), was a religious poem and he wrote many others, but his work is remembered for his satires which are interesting to posterity chiefly through their historical importance as a source of information concerning the social life of his time. His first satires, ‹The Letting of the Humours Blood in the Head-Vaine› (1600) and ‹A Mery Meetinge, or 'Tis Mery when Knaves Mete› (1600), were directed against several prominent persons whose names were thinly disguised in Latin. These were burned by the authorities, but were later republished under different titles. Afterward his satires chiefly concerned the middle and lower classes of society, some of them dealing with highwaymen of note and offering a highly interesting vocabulary of thieves' slang of the day. Several of his known works are lost. Besides works already mentioned he was author of the satires ‹'Tis Merrie When Gossips Mete› (1602); ‹Humor's Looking-Glasse› (1608); ‹Martin Mark-all, Beadle of Bridewell› (1610); ‹Good Newes and Bad Newes› (1622), etc. His last work was a religious volume ‹Heaven's Glory, Seeke it; Eart's Vanitie, Flye it; Hells Horror, Fere it› (1628).

**ROWLANDSON,** rō'lạnd-sȯn, **Mary White,** American captive among the Indians. She was carried away by the Indians after an attack on Lancaster, Mass., 10 Feb. 1675, during King Philip's War. For a time she was kept in an Indian village near the site of Petersham, Worcester County, and later was taken by her captors across the Connecticut, and after about three months was ransomed. Her ‹True History› of her captivity and restoration was printed at Cambridge, Mass., and in London, in 1682. A fifth edition was prepared by Joseph Willard (1828), and is reproduced in ‹Narratives of the Indian Wars› (New York 1913). The work, though not always clear as to detail, is interesting, and throws a graphic sidelight on Indian existence with its cruelty and squalor.

**ROWLANDSON, Thomas,** English artist: b. London, July 1756; d. there, 22 April 1827. He was sent at 15 to Paris and there studied art and gained a taste for the pleasures of the town. The £7,000 left him by a French aunt he gambled away, yet he hated debt, and maintained his uprightness of character. He traveled over England and Wales, and enjoyed life to the full in his tavern and the company of friends like Morland, Gilray and Bunbury. Rowlandson possessed rare dexterity of touch and fertility of imagination; and, though not seldom vulgar, he was never feeble. He was a relentless hater of Napoleon, belittling his greatness by countless travesties. Some of his best-known works are his ‹Imitations of Modern Drawings› (1784–88), and his illustrations for ‹Syntax's Three Tours,› the ‹Dance of Death,› ‹Sterne's Sentimental Journey,› ‹Peter Pindar,› the ‹Bath Guide,› ‹Munchausen,› etc.

**ROWLEE,** rou'lē, **Willard Winfield,** American botanist: b. Fulton, N. Y.; d. 15 Dec. 1861. He was graduated at Cornell University in 1888, became connected with the faculty there in that year and since 1905 has been professor of botany. He is a contributor to botanical journals and is author of ‹Lieut. Herman Rowlee (1746–1818) and His Descendents› (1907).

**ROWNTREE,** roun'trē, **B. Seebohm,** English manufacturer and sociological worker, son of Joseph Rowntree (q.v.): b. York, 1871. He was educated at the Friend's School, York, and at Owens College, and became a director in his father's business. He is active in social and political work. Author of ‹Poverty, a Study of Town Life› (1910); ‹Land and Labour› (1910); ‹How the Labourer Lives› (1913); ‹The Way to Industrial Peace› (1914); ‹Human Needs of Labour› (1918), etc.

**ROWNTREE, Joseph,** English manufacturer and social worker: b. 1836. He came of a Quaker family, was educated at the Friends' School, York, and later engaged in business. He established the firm Rowntree and Company, cocoa manufacturers, of which he is chairman. He is active in work for social improvement. Joint author of ‹The Temperance Problem and Social Reform› (7th ed., 1900); ‹British Gothenburg Experiments›; ‹Public Control of the Liquor Traffic› (1903); ‹The Taxation of the Liquor Trade› (1909), etc.

**ROWSON,** rō'sȯn, **Susanna Haswell,** American actress and author: b. Portsmouth, England, 1762; d. Boston, 2 March 1824. Her first work, the novel, ‹Victoria,› appeared in England in 1786, and in 1792 she made her stage début at Edinburgh. In 1793–96 she acted in the United States, closing at Boston with a comedy by herself, ‹Americans in England.› From 1797 until her retirement in 1822 she conducted with much success a seminary for young ladies, first at Boston, and from 1800 at Medford. Her most popular work was ‹Charlotte Temple, or a Tale of Truth› (1790), which had in its time wide sale, but is called by Wendell a «comically extravagant example» of a literary manner then much in favor. Further she wrote, among several volumes, ‹The Inquisitor› (1788); ‹The Volunteers› (1793); ‹Miscellaneous Poems› (1804). There is a memoir by Nason (1870).

**ROWTON,** row'tȯn, **Montagu William Lowry-Corry,** 1st Baron of, English lawyer and philanthropist: b. 8 Oct. 1838; d. London, 9 Nov. 1903. He was educated at Trinity College, Cambridge, became a barrister in 1863, and entered upon a successful career as a lawyer. He was secretary to the Earl of Beaconsfield in 1866–68 and in 1874–80, and was secretary of the special embassy sent to the Berlin Congress in 1878. He was created a baron in 1880. He established the Rowton lodging-houses in London some three years before the Mills Hotels were instituted in New York. They were built with the idea of furnishing decent and comfortable lodgings for workingmen and furnishing them also with well-cooked and substantial food at very moderate rates, yet at the same time with the intention of keeping the enterprise on a paying basis. He was chairman of the Rowton Houses and of the Guinness Trust until his death.

**ROWTON HEATH,** England, a place near Chester, which was the scene of a battle 24 Sept. 1645, in which the Parliamentary forces defeated the Royalists. After the crushing disaster of Naseby, King Charles I had fled to Wales, and then formed the desperate project of marching north to Montrose. Chester was then being besieged by Sir William Brereton, but the king at the head of 5,000 troops succeeded in finding an entrance, and entrusted Sir Marmaduke Langdale with raising the siege. The Parliamentarians had just been reinforced by Poyntz's Yorkshire horse when Sir Marmaduke attacked them. He was utterly defeated, with a loss of 300 killed and 1,000 prisoners, and the disaster, added to Philiphaugh, deprived the unhappy king of his last hope.

**ROXBURGHE CLUB,** an English book club founded in London in 1812, during the auction sale of the Duke of Roxburghe's famous library. The title of founder was claimed by Rev. Thomas Fognall Dibdin, the club being formed at a dinner given to celebrate the purchase by the Duke of Marlborough of the Valdarfer ‹Boccaccio› (Venice 1471) for the sum of £2,260. The club had 24 members, and its object was to pledge its personnel to the reprinting of rare volumes. It was the first club of this order and is still in existence, the Dilettanti Society being on the same order, and with it forming the forerunners of the modern publishing societies.

**ROXBURY,** rŏks'bŭr-ĭ, Mass., now a part of the city of Boston, annexed in 1867. It has a diversified surface, a remarkable alternation of hill and hollows, which afford picturesque building sites, and which have made a great portion of Roxbury a residential section. There are a number of manufactories, among which are cotton and woolen mills, machine shops, cordage and carpet factories and organ works. A free Latin school was established in Roxbury in 1645. The place was for many years the scene of the labors of John Eliot (q.v.), the «Apostle of the Indians,» and his remains are in the «ministers' tomb» in the old burial ground. It is also the birthplace of Joseph Warren (q.v.) of Revolutionary fame. The township of West Roxbury, which contained the villages of West Roxbury and Jamaica Plain, was set off from Roxbury in 1852. When Roxbury was annexed to Boston it had a population of about 40,000.

**ROY,** roi, **Joseph Edward,** Canadian author: b. Lévis, Quebec, 7 Dec. 1858; d. 1913. He was educated at Laval University and entered the Dominion Public Service in 1880. From 1908 he was attached to the Bureau of Archives, Ottawa; and with his brother he founded the *Bullentin des Recherches Historiques,* to which he contributed extensively. Author of ‹Le Premier Colon de Lévis›; ‹L'Ordre de Malte en Amérique›; ‹Jean Bourdon et la Baie Hudson›; ‹L'Ancien Barreau au Canada›; ‹Histoire de la Signeurie de Lauzon› (5 vols.); ‹Rapport sur les Archives de France›; ‹Essai sur Charlevoix,› etc.

**ROYAL,** roi'al, **Joseph,** Canadian journalist and editor: b. Repentigny, Quebec, 1837; d. Montreal, 23 Aug. 1902. He was educated at the Jesuit College of Saint Mary's, Montreal, and engaged in journalism. He founded *Le Nouveau Monde* in 1857, and *L'Ordre* in 1859; and in 1864 was one of the founders of the *Revue Canadienne.* He was admitted to the bar in 1864, and 1870 settled in Manitoba, where he founded *Le Metis,* and also engaged in law practice. He served in the Manitoba legislature in 1870–79 and was successively speaker privincial secretary, attorney-general and minister of public works. He secured the abolition of the legislative council and the establishment of the University of Montreal. He was elected to the Canadian Parliament in 1888, and in 1889–93 was lieutenant-governor of the northwest Territories. From 1893 he edited *La Minerva* at Quebec. Author of ‹Histoire du Canada, 1841 à 1867› (1909).

**ROYAL ACADEMY OF ARTS, The,** a British institution for the encouragement of painting, sculpture and designing; founded in 1768 by George III, with Sir Joshua Reynolds as president. It is composed of a president (P.R.A.), 40 academicians (R.A.) and 20 associates (A.R.A.), which include professors of painting, architecture, anatomy and perspective. It holds an annual exhibition open to all artists, at Burlington House, London, of paintings, sculpture and designs which reach a certain standard of merit.

**ROYAL ACADEMY OF MUSIC,** London, England, an institution established in 1823, mainly through the exertions of Lord Burghersh (afterward Earl of Westmoreland), and incorporated by royal charter in 1830. The purpose for which it was founded was to afford a first-class musical education in the various branches of music. It receives a grant from the government, and from this and other sources is able to award to successful competitors a large number of scholarships and prizes. Instruction is given in musical composition, singing and instrumental playing. Concerts are given at intervals by the pupils. Connected with the R.A.M. are associates, fellows and licentiates, besides honorary members. Among its principals have been Sir George Mcfarren and Sir A. C. Mackenzie.

**ROYAL ACADEMY OF SCIENCE, The,** a Danish institution in Copenhagen, established by the king of Denmark in 1743. It has published transactions (‹Skrifter›) since its foundation, and memoirs (‹Afhandlinger›) since 1823.

**ROYAL ACADEMY OF SCIENCES, The,** a German institution in Berlin, founded by Frederick I in 1700; had Leibnitz as its first director, and held its first meetings in 1711. It is divided into four sections, devoted to mathematics, physics, philosophy and history. It publishes memoirs and monthly reports.

**ROYAL ACADEMY OF SCIENCES, The,** a Swedish institution, known also as the Royal Sweedish Academy, founded in Stockholm as a private society in 1739; incorporated under its second name in 1741; issues annual volumes of ‹Transactions,› which were at first published quarterly.

**ROYAL AIR FORCE,** the official name of the aviation service of the British army and navy, promulgated in March 1918, in accordance with the Air Force (Constitution) Act, 1917, providing that «it shall be lawful . . . to raise and maintain a Force, to be called the Air Force, consisting of such numbers of officers, warrant officers, non-commissioned officers and men, as may from time to time be provided by Parliament.» An Order in Council dated 7 March 1918 decreed that the Air Force be established under the style and title of «The Royal Air Force.» The name hitherto in use was the Royal Flying Corps. The measure involves the creation of an air council presided over by a new secretary of state, and endowed with powers similar to those of the Admiralty and the army council. In regard to discipline, the annual Army Act, subject to certain modifications, will also apply to the Air Force.

**ROYAL ARCANUM, The,** a fraternal and beneficial society organized, 23 June 1877 at Boston, Mass., by Dr. Darius Wilson and John Andrew Cummings. The original council in Boston had but nine members. Other councils were soon established in the same city and the order spread rapidly throughout the New England States. It increased at a rapid rate and now there are councils in every State and in almost every city and town in the Union. The business of the order is conducted in Boston, where the society owns a substantial building, in which the supreme council meets. The society is governed through councils which are dominated by the supreme council or governing body. The membership qualifications are good health and character; and the age limit is between 21 and 55. Benefit certificates are issued for $1,500 and $3,000, payable at the death of a member. Should a member desire to increase his insurance over the limit fixed by the society he can do so by making application for the increase in the Loyal Additional Benefit Association, formed in 1889, practically within the Royal Arcanum and incorporated in 1890 under the State laws of New Jersey.

The officers of the supreme council or governing body of the society consist of supreme regent, supreme vice-regent, supreme orator, sitting past supreme regent, supreme secretary, supreme treasurer, supreme auditor, supreme chaplain, supreme warden, supreme sentry and legal adviser. The grand councils and subordinate councils have a similar roster of officers.

From 1898 to 1903, its greatest period of growth, the membership according to official data, attained the following figures:

| | Membership | Grand councils | Subordinate councils |
|---|---|---|---|
| 1898 | 193,573 | 22 | 1,762 |
| 1902 | 249,644 | 27 | 2,004 |
| 1903 | 258,746 | 28 | 2,045 |

For the same period the total number of deaths and the total amount of benefits paid were as follows:

| | Number of deaths | Amounts paid |
|---|---|---|
| 1898 | 16,479 | $47,886,199 |
| 1902 | 25,714 | 73,817,678 |
| 1903 | 27,480 | 76,190,352 |
| Emergency fund 31 Oct. 1902 | | 1,813,141 |
| Emergency fund 28 Feb. 1903 | | 1,885,786 |

Rates of assessment being too low to cover all expenses and ensure permanency the society at times has had to readjust its financial policy with the result that a firm foundation has been established which actuaries and insurance experts confirm as safe and sound. According to recent figures the status of membership, deaths and benefits paid, was:

| YEAR | Membership | Grand councils | Councils | Deaths | Amounts paid |
|---|---|---|---|---|---|
| 1918 | 143,042 | 32 | 1,619 | 3,437 | $6,600,337 27 |
| Emergency fund 30 April, 1918 | | | | | 4,341,675 44 |

The emblem of the association is a royal crown in a circle, on the circumference of which are 10 small Maltese crosses with the motto, «Virtue, Mercy and Charity.»

**ROYAL ARCH MASONS.** See MASONIC FRATERNITY.

**ROYAL BLACK ENCAMPMENT OF ISRAEL.** See ORANGEMEN.

**ROYAL COLLEGE OF MUSIC,** London, England, an institution established in 1883 in South Kensington under the presidency of the Prince of Wales, afterward Edward VII. It was endowed at its commencement by gifts to the amount of $630,000. Pupils of either sex are admitted either as fee-paying students or as scholars or exhibitioners. There are 52 open free scholarships and 11 close free scholarships, besides the council exhibitions, the Savage Club exhibition, the exhibitions of the associated board of the Royal Academy of Music (q.v.) and the Royal College of Music, etc. Prizes and medals are also awarded to the students in accordance with the results of examinations. The associateship may be obtained by outsiders as well as pupils on passing a qualifying examination, and entitles the holder to use the initals A.R.C.M. The professorial staff includes several eminent names.

**ROYAL CROWN OF HAWAII, Order of.** See ORDERS, ROYAL.

**ROYAL ECONOMIC SOCIETY,** incorporated 1902, was formerly known as the British Economic Association, a society established in London in 1890 with the design of advancing economic investigations through the medium of a quarterly styled *The Economic Journal.* This periodical is the most valuable one of its class and is open to the expression of very diverse views upon economic questions. Viscount Goschen was the president of the association from its founding until his death in 1907. He was succeeded by Lord Haldane. It gives an annual dinner in London, but holds no regular scientific meetings.

**ROYAL FAMILY, The,** in its widest sense, as referring to Great Britain, embraces all the British descendants of the royal house; in its narrower sense it includes only the queen-consort and queen-dowager, with all the lineal descendants of the sovereign. The husband of a queen-regnant is not as such a member of the royal family. The members of the royal family have precedence over all peers and officers of state; but an heir-presumptive has no rank or precedence as such, as his position may be altered by the birth of an heir-apparent.

**ROYAL FERN.** See OSMUNDA.

**ROYAL FLYING CORPS** (R. F. C.), the aeronautical branch of the British armed forces. The title originated in March 1912.

**ROYAL GEOGRAPHICAL SOCIETY.** See GEOGRAPHICAL SOCIETY, ROYAL.

**ROYAL GEORGE,** English man-of-war, sunk in Portsmouth Harbor, England, 29 Aug. 1782. While undergoing repairs at the keel the vessel suddenly careened and filled with water, going down with all on board. The ship, the principal vessel of Lord Howe's fleet, was commanded by Admiral Kempenfeldt, and carried about 1,100 persons, including nearly 300 women and children. The disaster was commemorated in an elegy by Cowper, 'The Loss of the Royal George.' The first attempt to raise the vessel was made in 1817; but it was not until 1839 that portions of the ship and its cargo were brought to the surface, when the sunken mass was exploded by means of great quantities of gunpowder.

**ROYAL HISTORICAL SOCIETY,** an English society founded in 1868 for the purpose of promoting and fostering the study of history «by assisting in the publication of rare and valuable documents, and by the publication from time to time of volumes of Transactions and Publications.» The Society was incorporated 31 July 1889 and has since enjoyed the patronage of the sovereign. The Camden Society was amalgamated with it 2 May 1897 and the Camden Series of publications was transferred to it. The Society consists of president, ordinary fellows, honorary fellows and corresponding members, and is open to international membership; the honorary fellowships are limited to 75, of which only 25 may be British subjects. The membership is about 700, and in 1917 it had published 195 books and manuscripts besides the 57 published by the Camden Society in its separate existence, 1838–97.

**ROYAL INSTITUTION OF GREAT BRITAIN,** an institution founded in 1799 by Count Rumford, Sir Joseph Banks and other men of science, and incorporated in 1800. It was reconstituted on a wider basis in 1810, and has for objects the promotion of scientific and literary research, the teaching of the principles of experimental science, the exhibition of the applications of these principles to the arts, and the affording of opportunities for study. Many distinguished chemists and physicists have conducted their researches in the laboratories. The library contains some 60,000 volumes.

**ROYAL LION, Order of.** See ORDERS, ROYAL.

**ROYAL LOUIS ORDER, The.** See ORDERS, ROYAL.

**ROYAL NAVAL COLLEGE OF CANADA,** an institution for training cadets for the navy. Entrance examinations are held in May at the appointed centres of the Civil Service Commission. The Civil Service Commission, Ottawa, furnishes on application blank forms for admission and information of requirements and dates and places of examination. The examination fee is $4. The age of admission is from 14 to 16 years and each candidate undergoes a medical examination for physical soundness and fitness, besides the educational examination in arithmetic, algebra, geometry, geography, history, writing and dictation and either French or German. Additional marks may be obtained on two of four optional subjects — Latin, elementary science, drawing or a second modern language. The college course extending over three years comprises: mathematics, navigation, mechanics, physics, chemistry, engineering, seamanship, pilotage, English, French or German, geography and history (including naval history). Each cadet pays annually — in advance — a fee of $100 and in addition a fee of $350 for the first year and $225 for each succeeding year. These fees cover tuition and living expenses, including furniture, bedding, mess equipment and table board. There are vacations of six weeks at Christmas and six weeks in summer. By arrangement, graduates of the college are admitted to the second year of the course of applied science in McGill University, or the University of Toronto, entrance for which is obtained through competitive examinations. Candidates must be British subjects and they or their parents must have resided in Canada for two years immediately preceding the examination. Absence abroad for schooling during a short period may be considered as residence in Canada. The Dominion Department of the naval service does not require cadets to adopt a naval career and does not commit itself to issue commissions to graduates of the Naval College. The British Admiralty accepts each year eight cadets who have completed their course at the college, if these cadets have attained the required standard of efficiency, and they are entered in the Royal Navy as cadets of the same standing as graduates of the Dartmouth Naval College. The college was opened at Halifax, Nova Scotia, in January 1911. Owing to the partial destruction of the college buildings at Halifax in the disastrous explosion of 6 Dec. 1917, temporary quarters were located in the Royal Canadian Naval Dockyard at Esquimalt, British Columbia, pending a decision for the definite location of permanent college buildings.

**ROYAL OBSERVATORY,** Greenwich, England, the famous observatory established by order of Charles II, who appointed John Flamsteed astronomical observer 4 March 1675 at a salary of £100 ($500), for which he was also to instruct two boys from Christ's Hospital. The first observation was made 19 Sept. 1675. The observatory was established to meet the requirements of navigation and not only has amply fulfilled its object, but under the distinguished successors to Flamsteed has contributed to the higher branches of science, some of the most important of the astronomical and physical discoveries of modern history. Among the directors of the observatory have been Edmund Halley (1720–42); James Bradley (1742–62); Nathaniel Bliss (1762–65); Nevil Maskelyne (1765–1811); John Pond (1811–36); Sir George Airy (1836–81); Sir William Chrystie (1881–1910); Dr. Frank Watson Dyson (1910). The director of the observatory is styled the astronomer royal, and is under the official control of the Admiralty, but receives his appointment directly from the Prime Minister, and holds office by warrant under the royal sign manual. The largest instrument is a 28-inch refractor, with spectroscope attached. Another fine instrument is the astrographic equatorial designed for work in connection with the «Photographic Chart of the Heavens.» It consists of two telescope tubes rigidly connected and parallel, one carrying a 10-inch telescope lens, the other a 13-inch photographic lens by which the star images are imprinted on the photographic plate. The Greenwich section of this important work was completed at the end of 1909. The Thompson equatorial, presented to the observatory by the late Sir Henry Thompson, has on one side of the declination axis a telescope with a lens corrected for photographic rays of 26 inches aperture, and on the other side a telescope with a mirror of 30 inches diameter. A photographic spectroscope is mounted on the reflector. The refractor is being used to determine the distances of stars. Photographs of the sun are taken on every available day, and after being measured are carefully stored for reference, giving a daily record of sunspots for the last 35 years. The chronometers used in the navy are purchased after «trial» at the observatory. The average number being tested daily is about 600. Every hour during the day time-signals are sent out from the standard «motor clock» of the observatory through the postal telegraph service, giving Greenwich time to all parts of the United Kingdom. The true basis of accurate astronomy was laid by James Bradley's observations of 3,222 stars at Greenwich; the observatory has the 24-inch reflector by which the satellites of Uranus and Neptune were discovered by Lassell; and at Greenwich in 1908 the eighth satellite of Jupiter was photographically discovered by Melotte. *Astronomical Observations* founded 1750 and published annually since 1838 contains a continuous record of the moon's position since 1750. At Greenwich in 1767 Nevil Maskelyne founded the *Nautical Magazine*. The observatory staff consists of the director, two chief assistants, six assistants and a staff of computers. See OBSERVATORY.

**ROYAL ORDER OF VICTORIA.** See ORDERS, ROYAL.

**ROYAL ORDERS.** See ORDERS (ROYAL) AND DECORATIONS OF HONOR.

**ROYAL AND PROTESTANT ORDER OF SAINT JOHN.** See ORDERS, ROYAL.

**ROYAL SOCIETY OF EDINBURGH,** a society which was incorporated in 1783, having been developed from the Philosophical Society of Edinburgh, commenced in 1739. Among its early members were Hume, Reid, Edmund Burke, Hutton, Dugald Stewart and James Watt; and among its presidents have been Sir Walter Scott, Sir David Brewster, the Duke of Argyll, Lord Moncrieff and Sir William Thomson.

**ROYAL SOCIETY, London,** an organization which owes its origin to a club of learned men who were in the habit of holding weekly meetings in London as early as 1645, although the year 1660 is generally given as the year of its foundation. Charles II took much interest in the proceedings of the Society, and in 1682 granted a charter to the «President, Council and Fellows of the Royal Society of London for Improving Natural Knowledge.» Lord Brouncker was first president of this incorporated Royal Society. Meetings are held weekly from November to June for the purpose of reading and discussing scientific papers; and the more important of these are published in the annual 'Philosophical Transactions,' first issued in 1665, and now forming a most valuable series. Accounts of the ordinary meetings, with abstracts of papers, etc., appear also in the periodical 'Proceedings,' begun in 1800. Scientific research has at all times been both initiated and encouraged by the Royal Society, and many of the most important scientific achievements and discoveries have been due to its enlightened methods. It deservedly enjoys an influential and semi-official position as the scientific adviser of the British government, and not only administers the $20,000 annually voted by Parliament for scientific purposes, but has given suggestions and advice which have borne valuable fruit, from the voyage of Captain Cook in the *Endeavor* in 1768 down to the *Challenger* expedition, more than a century later. The society has an independent income.

**ROYAL SPANISH ACADEMY, The,** an institution established at Madrid in 1714 for the same purposes as the French Academy. The number of members is limited to 24.

**ROYAL UNIVERSITY OF IRELAND.** See NATIONAL UNIVERSITY OF IRELAND.

**ROYALL,** roi'ąl, **Isaac,** American soldier: b. Massachusetts, about 1720; d. England, October 1781. He was a wealthy citizen of Medford, was its representative for many years in the General Court, and for 21 years was a member of the executive council. He served in the French War, and in 1761 was appointed brigadier-general, the first resident of New England to attain that rank. At the outbreak of the American Revolution he remained loyal to the Crown, and in 1775 left the country. His estates were confiscated and he was proscribed in 1778, but seems to have borne no enmity to his native land, as he bequeathed 2,000 acres of land in Worcester County to found a law professorship at Harvard, and made various other patriotic bequests. The town of Royalston, of which he was one of the original proprietors, was named in his honor, and the chair of law was established in his name at Harvard in 1815.

**ROYCE,** rois, **Charles C.,** American naval officer and historian: b. Defiance, Ohio, 22 Dec. 1845. During the Civil War he was an officer in the United States navy; from 1866 to 1876 was an official of the United States Indian Bureau and of the Bureau of Ethnology of the Smithsonian Institution from 1876 to 1885. During the 47th Congress he was secretary to the speaker of the House of Representatives. In 1908 Mr. Royce was elected junior vice-commander-in-chief of the Grand Army of the Republic by the National Encampment. He has published 'A History of the Cherokee Nation of Indians'; History of Indian Land Cessions to the United States'; 'The Indian Title: the Method and Chronology of its Extinguishment' — all published by the Bureau of Ethnology. He also wrote 'An Inquiry into the History and Identity of the Shawnee Indians'; and 'Biography of General John Bidwell, one of the Earliest of the California Pioneers.'

**ROYCE, Josiah,** American philosopher and educator: b. Grass Valley, Nevada County, Cal., 20 Nov. 1855; d. Cambridge, Mass., 14 Sept. 1916. Graduated (1875) at the University of California, he studied also at Leipzig and Göttingen (1876) and the Johns Hopkins University (1877–78), and in 1878–82 was instructor in English in the University of California. From 1882 to 1885 he was instructor in philosophy at Harvard, in 1885 was appointed assistant professor, and in 1892 was elected to the professorship of the history of philosophy, which he still retains. His views are very similar to those of T. H. Green (q.v.), the great English representative of the Neo-Kantian or Neo-Hegelian movement, and his position may be studied in the historico-critical work, 'The Spirit of Modern Philosophy' (1892). His clear, distinguished style as writer and lecturer has served to enhance his reputation in the United States, among whose leaders in philosophic inquiry he is highly ranked. Besides ‘California from the Conquest to the Vigilance Committee of 1856’ (1886), and ‘The Feud of Oakfield Creek’ (1887), a work of fiction, he has written ‘A Primer of Logical Analysis’ (1881); ‘The Religious Aspect of Philosophy’ (1885); ‘The Conception of God’ (1897); ‘Studies of Good and Evil’ (1898); ‘The Conception of Immortality’ (1900; Ingersoll lecture on immortality, 1899); ‘The World and the Individual’ (1900–01; Gifford lectures, 1899–1900); ‘Outlines of Psychology’ (1903); ‘Herbert Spencer’ (1904); ‘Philosophy of Loyalty’ (1908); ‘William James and other Essays on the Philosophy of Life’ (1911); ‘Sources of Religious Might’ (1912); ‘The Problem of Christianity’ (2 vols., 1913); ‘War and Insurance’ (1914); ‘The Hope of the Great Community’ (1917).

**ROYCROFTERS,** roi'krŏf-tėrz, **The,** the name applied to a colony of artisans and artists living at East Aurora, Erie County, N. Y. The founder of the Roycroft colony was Elbert Hubbard (q.v.), who in 1893 established here a printing establishment and a monthly period called *The Philistine.* Hubbard, imbued with a socialistic doctrine similar to that of William Morris (q.v.) of England, gradually gathered about him numerous kindred spirits, and since 1900 the Roycrofters have been producing handmade books, furniture and wrought-iron work, and have established schools of music, painting and sculpture. There are numerous workshops, a library, church and other buildings at East Aurora, occupied by the Roycrofters, who have increased until the colony numbers several hundred.

**ROYER-COLLARD,** rwä-yā-kō-lär, **Pierre-Paul,** French statesman and philosopher: b. Sompuis, Marne, 21 June 1763; d. Chateauvieux, 4 Sept. 1845. He was educated at the colleges of Chaumont and Saint Omer and later became an advocate in Paris. He was an active participant in the Pre-Revolutionary movement and was elected one of the representatives of the commune of Paris. During the ascendency of the Jacobins he retired to his native province, where he succeeded in avoiding their suspicions. In 1797 the department of Marne sent him to Paris as a member of the Council of the Five Hundred and there he endeavored to serve the republic. But his sympathies were not with the Napoleonic régime. His correspondence with Louis XVIII begun at this period, which was also marked by his temporary retirement from political life. In 1809 he was appointed to the chair of philosophy in the University of France and later became known as the head of the «doctrinaire» school. At the Bourbon restoration in 1814 he was made Councillor of State and Chief of Public Instruction. In 1827 he was admitted to the French Academy and in 1828 became president of the Chamber of Deputies. In 1842 he retired from public life. He left few published works, but these reveal him as at all times on the side of freedom and enlightenment. In the support of the house of Bourbon he sought the overthrow of an empire which seemed to him to have usurped greater privileges than those of the monarchy it supplanted. His biography has been written by Barante (1878), Spuller (1895) and Vingtain (1858). For an outline of his philosophy consult Jouffroy's translation of Reid.

**ROYERSFORD,** roi'ėrz-fėrd, Pa., borough of Montgomery County, on the Schuylkill River, 30 miles northwest of Philadelphia, on the Pennsylvania and the Philadelphia and Reading railroads. There are stove foundries, machine shops, bottle works and silk factories. Pop. (1910) 3,073; (1920) 3,278.

**ROZE,** rōz, **Marie,** French opera singer: b. Paris, 2 March 1850. She was a favorite opera singer of Paris for many years. Her first appearance in London was in 1872. There she was received with favor also and sang in Italian opera during the next four years. She was married to Mr. Mapleson, her manager, in 1897 and sang for two years in America, when she returned to the London operatic stage.

**RUATAN,** roo-ā-tän', or **ROATAN,** rō-ā-tän', an island of Central America, in the Bay of Honduras, is 30 miles long by 10 miles wide. Its coast has dangerous reefs, except at the south, where there are a few good roadsteads, and at the east, where there is one, called Port Royal, which is ample and deep, though difficult of access. The soil is fertile and the cocoa-palm, figs and vines grow without cultivation, while vegetable growth is abundant. Ruatan has three dependencies, Bonaca, Utila and Barbareta, comprising the colony of the Bay Islands. These islands were ceded to Honduras in 1856 by Great Britain. Pop. from 2,000 to 4,000.

**RUBÁIYÁT** (roo-bī-yät') **OF OMAR KHAYYAM.** The collection of quatrains known as the «Rubá'iyát of Omar Khayyám,» owes its fame less to its author, the astronomer-poet of Persia, than to its translator or adapter, Edward FitzGerald, whose version has become one of the monuments of English literature, and the inspiration of innumerable imitations and parodies.

The original author, Ghias 'uddin Abul-Fath Omar ibn Ibrahím-al-Khayyám, was born in Naishápúr, Persia, early in the 11th century A.D.— some hold as early as 1020 — and died at a ripe old age about 1123. He was a man of profound learning, by profession a mathematician and astronomer, one of eight scientists chosen by the Sultan Malik-Shah to reform the Mohammedan calendar. No less was he a philosopher, poet and humorist, a man of bold and independent thought and many-colored fancy; and in his leisure moments he embodied his varied reflections in stray quatrains that have come down to us as the ‘Rubá'iyát of Omar Khayyám.’ The word «rubá'i-yát» simply means «quatrains,» being the plural of «rubá'iy.» The rubá'iy is a complete poem of four lines, the first, second and fourth lines rhyming, complicated triple, quadruple and even quintuple rhymes being employed. The third line is usually, but not always, left unrhymed. There exist in various Persian manuscripts about 1,200 rubá'iyát attributed to Omar, not more than 500 of which are considered authentic by even the most generous critics. These rubá'iyát, each presenting a distinct thought and unrelated to any other rubá'iy, appear in the Persian manuscripts arranged alphabetically according to the terminal letters of the rhymed lines. Edward FitzGerald, in creating his remarkable English version first published in 1859, not only selected, combined and remolded such rubá'iyát as appealed to his genius, but also arranged them so as to produce an effect of continuity of thought wholly lacking in the original. He thus evolved a meditative poem or elegy of marvelous melody and power, emphasizing, however, one phase of Omar's thought to such a degree that a contemporary wrote, «The Rubá'iyát will come in time to be recognized as the highest expressions of agnosticism.»

The philosophy of the Rubá'iyát as presented by FitzGerald is in effect: «We know the loveliness of this world, we know nothing of the Hereafter; but God, who created us as we are, will not punish us for being as He made us; let us then enjoy the only life of which we are sure, before we inevitably pass into darkness.» Without denying that this may be considered the old Persian's dominating thought, it must be added that Omar, being at least nominally a Mohammedan, had his moments of piety, and never wrote anything as daring as Stanza LXXXI of FitzGerald's version. Some have even maintained that Omar was a devout member of the Súfi sect, and insist on allegorical and religious interpretations of his praises of wine and beauty. But we are safest in considering the quatrains as expressions of the conflicting moods of an essentially human personality.

FitzGerald's version in the author's fourth and final edition contains 101 quatrains. There are numerous other more extensive and more literal, though far less delightful translations in French, German, English, Hungarian and Norwegian. Several of these translations may be found, presented with FitzGerald's work, in the 'Rubá'iyát of Omar Khayyám' (Multi-Variorum ed., edited by Nathan Haskell Dole, Boston).

Arthur Guiterman.

**RUBBER**, an elastic, resilient substance derived from numerous trees and vines found scattered widely over the tropics. Its proper name is Caoutchouc and it is classified in the hydro-carbon family; the chemically pure product being described by the symbols $C^{10} H^{16}$. Commercially pure rubber, however, contains several other things such as moisture, albumin, resin, sugar, mineral matter and oil. The discovery of rubber is attributed to Columbus who, as the story goes, found the natives of Hayti playing a game of ball with a resilient, bouncing material. Later voyagers from France on a mission involving certain geographic surveys made a closer analysis of this substance including in their reports a rather detailed description. One main fact brought to light by these men was that Caoutchouc was derived from a lacteal fluid and not from the sap of the trees as is, even now, commonly supposed. See India Rubber; India Rubber Tree.

Caoutchouc is the term used to describe this substance in all but the English-speaking countries. The term «rubber» is the result of a discovery by Priestly, an Englishman, who in 1770, by experiment, found that small pieces of this coagulated latex were useful as pencil mark erasers. He immediately called them «rubbers» and for the want of a more descriptive one, this name rubber remained; until now it is accepted by all English-speaking people as descriptive of the crude material, which forms the basis of so many manufactured articles now classified as rubber goods.

Although Latin countries first interested themselves in rubber, particularly France, Portugal and Spain, and many items of native manufacture were exported from Brazil and other South American colonies to these countries; these, however, were looked upon simply as interesting curiosities and it fell to the English to really begin manufacture of rubber goods on a scientific basis, following extensive research work. The first patent covering rubber for practical use was issued in 1771 to Samuel Peal of London. His invention provided for the waterproofing of cloth by spreading it with a thin layer of melted rubber. This process was, however, attended by so many difficulties that Peal did not make progress and although the experiment doubtless served as a stimulant for further research and development, in itself resulted in nothing.

Next came Nadier, also an Englishman, who in 1820 patented the idea of manufacturing elastic thread by cutting thin strips from long slabs of rubber. These he intended should be woven into cloth. But his invention, likewise, proved impractical as it was then found impossible to design weaving machinery which would accommodate elastic thread. Three years after the failure of the elastic thread project of Nadier, Charles McIntosh of Glasgow, Scotland, obtained a patent for waterproofing fabrics. His process was accomplished by spreading a solution of coal-tar naphtha and rubber on a marble slab, allowing the solvent to evaporate. This resulted in a thin sheet of pure rubber which later was placed between two fabrics and fastened by means of needle and thread. In 1825 McIntosh established a factory for the manufacture of garments by this method. McIntosh's venture is regarded by many as the beginning of our modern rubber industry. The name still sticks — all garments of the double fabric texture variety, with rubber between, are still known universally as McIntosh's.

Three years prior to McIntosh's discovery, Thomas Hancock had also interested himself in the possibility of commercially developing rubber. Having spent his early days in mechanical pursuits, Hancock attacked the problem from an entirely different angle. That is, he worked out methods of preparing rubber through the application of machinery and by this means founded what is the real beginning of rubber manufacturing. His first patent granted in 1820, provided for improvements in the application of articles of dress such as wrist bands, waist and coat bands, garters, etc., by the introduction of rubber, that these might be rendered elastic and better fitting. To accomplish his purpose he worked out and designed the first rubber milling machinery. The compounding of rubber with other ingredients was also successfully inaugurated by Hancock. In fact, as early as 1825 he was mixing with rubber, coal-tar, Fuller's earth and coloring pigments for the purpose of strengthening, beautifying and making his products less sticky. He had considerable success in the manufacture of a varied line of rubber goods which, even now, would be considered fairly complete. His output included hose, belting, packing, shoes, inflated goods and also molded articles such as bumpers. Thus, it can be said that the manufacture of rubber goods really had its inception in England.

Although, in 1813 a patent was granted to Jacob Hummel, of Philadelphia, for a gum-elastic varnish, there seems to be no further mention of his product so evidently it was never put into use. Crude rubber and native rubber articles, such as shoes, water bottles, etc., were, however, brought to the seaports of New England in large quantities as early as 1823 and formed the inspiration for experimentation by a great many Americans who also had ideas for manufacturing rubber into various items of commerce. About 1831, McIntosh and Hancock, in England, began to manufacture a varnish by dissolving rubber and lamp black in spirits of turpentine. This was supposed to provide a waterproofing material suitable for use in the manufacture of footwear and coats. The Roxbury India Rubber Company, of Connecticut, was chartered in 1833 for the manufacture of footwear and clothing under this patent. Following this, small rubber factories sprung up all over New England but none attained success because they failed to take into consideration the nature of the material with which they were working, viz., its tendency to soften and stick in warm temperatures and become hard and brittle under the influence of cold. Among the prominent factories which had failed about 1838 was one in Woburn, Mass., which shut its doors early in the summer of this year leaving Nathaniel Hayward as caretaker. Hayward, having little to do and being of an investigating turn of mind, used the materials at hand for experimentation. During his experiments he happened upon the idea of mixing a small amount of sulphur with rubber and treating the mixture with acid gas fumes, the latter idea having previously been worked out by Charles Goodyear. Hayward patented this process, acknowledging in his application the use of the Goodyear acid gas treatment. Charles Goodyear was a native of Connecticut and son of an importer and manufacturer of buttons, hardware and farm implements. At the time Goodyear's interests were aroused in rubber, he was engaged at Philadelphia in operating the first retail hardware store in the United States and had amassed from this business a considerable fortune. Hearing of Hayward's invention, he promptly purchased from him the patent rights. Thus began the trials of the man whose devotion to an idea has made the great rubber industry possible.

The sulphur and acid gas treatment did not work well as he supposed it would and it was not until the winter of this same year that Goodyear made the final discovery of the process of vulcanization. Although an educated man, he was not versed in analytical chemistry and his discovery was made by exploration into the field of the unknown rather than by experiment. He had mixed sulphur with rubber and while discoursing on the subject so dear to his heart one cold night, so the story goes, a piece which he had in his hand accidentally touched the red hot door of the kitchen stove. To the astonishment of Goodyear, an ounce or two which stuck on the stove hardened without melting. He rushed to the other side of the room, seized a knife and scraped the residue from the stove while his relatives and neighbors looked on with the conviction that he had finally gone insane. Scraping the residue from the stove and washing it he found «vulcanized rubber.» Thus, by chance, Goodyear discovered the vital link which now makes possible the use of automobiles and thousands of other machines.

Goodyear was entirely out of funds through bad credits extended by the hardware business and his devotion to rubber experimenting. It was not until 1844 that he finally applied for and was granted a patent on his discovery. Even then he had great difficulty in convincing others that this was not a myth, the same as they had found his acid gas process to be.

Laverett Candee is said to have been the first to take practical advantage of Goodyear's discovery. He, at least, bought a license from Goodyear to manufacture footwear the same year the patent was granted. From the start rubber shoes were found to be well adapted for hard service and sales made a slow but substantial growth. The success of Candee caused many others to enter the business of rubber manufacture and within a comparatively few years there were several concerns turning out a variety of products. Among the first were, Ford and Company of New Brunswick, N. J.

The path of the American rubber manufacturer, in spite of the assured success of rubber goods through the discovery of vulcanization, was not, however, one of ease and affluence. Many difficulties attended the establishment of rubber factories that were not of a mechanical nature. Tariff reforms were needed badly. Our monetary system was in a state of flux; other industry as a consequence was at a low ebb. Accordingly, the demand for rubber goods did not exist. In fact it was not until after the close of the Civil War that rubber manufacture, through the improved industrial condition of the United States and the development of railroads, began to come into its own.

Goodyear died financially discredited, leaving no legacy to his heirs in the way of participation in the fruits of his efforts, although credited with having made a great fortune from his discovery. He spent money lavishly in advertising; in fact, during the year 1851 he made an impressive exhibit of American made rubber goods at the Crystal Palace (London) exhibition where he contracted more debts than he could conveniently meet and was thrown into prison. Many infringements were made and he was called upon repeatedly to sustain his patent claims in court. This took a great deal of money.

The Civil War had furnished the impulse toward a general industrial expansion in the United States and development of transportation carried manufacturing further West.

Rubber manufacture was established west of the Allegheny Mountains and thus we have what is known as the beginning of the Rubber Era. As Hancock had shed light upon the possibilities of rubber as an every-day commodity; as Goodyear had discovered the means for making these ideas realities; so Dr. Benjamin Franklin Goodrich developed the channels through which dreams and discoveries of his predecessors were able to be enjoyed by men in all walks of life. It was he who blazed the trail of practical manufacture and first demonstrated the real scope of rubber manufacture in the central west, which resulted in opening up one of the leading industrial cities in the United States. Dr. Benjamin Franklin Goodrich became involved through a real estate transaction in the Hudson River Rubber Company of Hastings, N. Y., a concern which had made a failure. Like Goodyear he became intensely interested in the future of rubber; so much, in fact, that he gave up his real estate interests to make rubber manufacturing his life profession. He came west seeking capital and landing in Akron sold himself and his defunct New York Rubber Company to the prominent members of the Akron Chamber of Commerce. In 1870 the machinery was moved to Akron, the original company being incorporated 31 December. The building occupied was a two-story brick structure, 50 by 100 feet and 20 people constituted the entire pay-roll. The first products consisting of hose, billiard cushions and belting were placed upon the market in May 1871. Thus, from a 20-man beginning, Akron, Ohio, has developed into the rubber manufacturing centre of the world. In normal times something like 65,000 workmen are employed in turning out about $300,000,000 worth of rubber goods — over one-third of the production of the whole United States.

No hard-and-fast rule can be laid down by which to classify rubber products. There are, however, to-day 12 general divisions of manufacture and sales which are quite generally recognized both from the standpoint of manufacturing and marketing. While several lines are often sold through the same factors the problems of selling the different lines are somewhat diversified, and hence the necessity for continuing the classification into the sales end of the business. These lines are, viz., footwear, mechanical rubber goods, rubber sundries, insulated wire, hard rubber items, solid tires, pneumatic tires, auto accessories, tire repair materials, rubberized fabric products, dipped goods and lathe cut items.

The rubber business in America can be said with truth to have begun with the rubber shoe in 1823. A few pairs were at that time brought to Boston by a sea captain, plying between the ports of South America and New England in the rum trade. During 1825, 500 pairs of crude native-made rubber shoes were brought to Boston and found a ready market. Although thick and clumsy, being made from the raw unvulcanized gums, these readily sold for from $3 to $5 per pair. Although having many drawbacks as an item of wearing apparel, they were, nevertheless, waterproof; and, being a curiosity, found a ready market among the rich. The following 15 years probably saw 1,000,000 pairs of these crude rubber shoes brought into the United States and all found ready sale. When, however, the mechanical process of rubberizing fabric with a varnish of spirits of turpentine, lamp black and rubber made possible the construction of rubber shoes on a factory basis the popularity of rubber shoes died out. The shortcomings of unvulcanized rubber then became more generally recognized, i.e., its tendency to viscousness in warm and its brittleness in cold weather and The Roxbury India Rubber Company, established in 1833, for the manufacture of shoes after this plan, met with ignominious failure in less than three years.

Immediately after Goodyear's discovery of vulcanization, L. Candee, who purchased the first license to manufacture rubber goods under this patent, repopularized the rubber shoe and put it on the market to stay and this company has continued to the present time as one of the important factors in the American rubber footwear industry. One very important event in the history of the rubber boot and shoe business in the United States occurred in the fall of 1892 when the United States Rubber Company purchased nearly all the larger rubber footwear interests of this country. This centralization resulted in conspicuous economies for while the industrial units of this combination have remained under their former management, they have shared their individual profits in common. The patents and secret processes of one factory became the property of all and in this way all important methods and formulæ which each factory enjoyed before were equally shared by the whole organization. There was also a great saving in the matter of crude rubber purchases, the large single purchase being made at great advantage over a number of small scattered purchases. Other advantages also accrued by eliminating the necessity of carrying large stocks and in diminishing the duplication of a large «last» equipment.

The next great step in rubber footwear development came as a result of experiments made by the B. F. Goodrich Company. This company entered the footwear business in 1905, making a line of light-weight wear under a contract for one of the large jobbers. In 1913 the Goodrich Company introduced their *Hi*-press line of heavy boots and shoes made by an altogether new process resulting in a quality far beyond what had been previously possible. In 1916 the Goodrich Company reorganized its footwear manufacturing and sales departments coming out, at that time, with a complete line which they began to market direct to the retailer. In 1917 the Firestone Tire and Rubber Company of Akron also launched a rubber footwear department.

Although for many years the footwear business monopolized the bulk of the crude rubber imports, other lines have now developed to the point where but 8 per cent is utilized by this division. The growth of the rubber shoe business, has, however, been very phenomenal. From an annual output in 1860, valued at $795,000, the increase has been in leaps and bounds. To show its growth in chronological order, in 1870 the value reached $8,000,000; in 1880, $16,000,000; in 1890, $24,000,000; in 1900, $40,000,000; in 1914, $60,000,000 and during 1918 the production reached the grand total of 65,750,000 pairs, worth, approximately, $125,000,000. Sales during these two years were, however, largely augmented through the necessities of the warring nations for large quantities of waterproof shoes. For 1919 the output of rubber shoes was valued at $64,713,182.

The manufacture of mechanical goods began with hose and belting; but development in this field has probably been more prolific in invention than in other lines of rubber manufacture. To-day the full mechanical line not only embraces belting and hose but about 30,000 molded items such as bumpers, valve discs, etc. Packing of several kinds for steam engines, etc., is also an important item. Rubber insulated wire of all kinds, floor covering such as matting and tiling, while decklestraps, billiard cushions, etc., are also embraced within this class. To give an idea of the volume of business which is done in rubber mechanical goods the last item (billiard cushions) uses one-fourth million dollars' worth of crude rubber each year and this by no means is the largest single item.

Rubber sundries had their inception many centuries before the discovery of America in the form of native bottles, canteens, etc. Manufacture began, however, with Hancock in England, about 1825. He designed and patented several articles such as water bottles, air cushions, etc. In America the Union Rubber Company of New York can be said to be the first to manufacture sundries under the Goodyear patents. They started in business in 1857 and to-day this branch of rubber manufacturing occupies a most prominent place — the volume in sales running up to approximately 10 or 12 million dollars.

Rubber sundries embrace a large number of items. These are usually sub-classified into five divisions such as drug sundries which include hot water bottles, etc.; surgeons' sundries including drainage tubes, operating cushions, etc.; dental sundries including plaster bowls, etc.; stationers' supplies including bands, erasers, etc.; athletic sundries including tennis balls, baseball body protectors and golf balls. Many special items such as respirators are also included in the production of this division.

Insulated wire, although using a comparatively small proportion of crude rubber, is one of the most important divisions of the rubber business. Without rubber insulated wire, civilization could not exist as it does to-day. Building cables, automobile cables, mining cables, telephone wire and cables all depend upon the insulating qualities of rubber for their success. In other words, were it not for this rubber insulation, the «juice» would leak away long before it reached its destination. Several millions dollars' worth of this product alone are produced yearly in the United States — the output being confined to relatively few factories.

Charles Goodyear began the manufacture of hard rubber about 10 years after his patent was granted. In 1851 when he made his famous exhibit in London, hard rubber items played an important part in the display. The first article made to any extent was the comb. Goodyear's biographer, a personal friend, relates that the original combs cost 20 times as much as the ivory ones then in use, but only 20 years after this, the India Rubber Comb Company practically enjoyed a monopoly in the business. In 1898 the American Hard Rubber Company, a combination of several small companies, with a capital of $2,500,000 was organized and captured the bulk of the business. Other independent companies have since entered the field and to-day enjoy a large portion of the business.

Hard rubber differs from the soft product mainly in that there is more sulphur in the compound — the value sometimes reaching 30 per cent — and the cure is longer. Battery jars constitute, perhaps, the largest single item in hard rubber manufacture although the complete list embraces some 15,000 to 18,000 items. These are represented by tubing, steering wheel rims, pipe stems, buttons, fountain pen barrels and a multitude of articles necessary to the success of all sorts of electrical devices. For example, there are on every desk telephone set a dozen or more hard rubber pieces. As may be imagined the value in sales of hard rubber alone is considerable.

In so far as the motor truck is concerned the highway is, in truth, paved with rubber and had it not been for the solid rubber tire, the motor truck would have remained an experiment and the World War might not have been one for democracy. Even before the discovery of vulcanization, ideas were entertained for the reducing of vibration in vehicles by the use of rubber. As early as 1846, the firm of Charles McIntosh and Company of Manchester, England, perfected and manufactured a solid rubber carriage tire for Her Majesty's brougham. The Shrewsbury and Talbot Noiseless Tire and Cab Company, Ltd., of England and Brewster and Company of New York were the first to popularize this solid rubber vehicle tire. This tire was the Carmont, patented in 1881. Following this came the «Cushion,» a solid tire with a hollow or sponge rubber centre patented in 1884. The Internal Wire type patented by Grant in 1896 was, however, by far the most popular solid rubber carriage tire made. In 1891, J. A. Swinehart patented what is known as the side wire tire and this is the one which was introduced and first adopted for motor vehicle use. The side wire tire failed in motor vehicle service and the «steel base» type took its place and is the one in use to-day. This type is the outgrowth of experiments made by the B. F. Goodrich Company in 1909 to overcome the difficulties in motor vehicle service attending the use of other types.

The solid rubber carriage tire has largely died out due to clearly evident causes. The volume of business done in solid rubber motor truck tires is, however, astounding. Two and one-half million of tires were produced during 1918 representing in value something like $25,000,000.

The pneumatic tire was invented by Robert W. Thompson in 1845 for carriage uses but his patent was forgotten and in 1883 Charles Dunlop revived the idea in the form of a bicycle tire. The growth of the bicycle business is well known, but in its palmiest days there were never as many in use as to-day. Approximately 3,500,000 bicycle tires are in service, wearing out yearly one tire each and the average yearly production of bicycles is one-half million.

The pneumatic automobile tire is the outgrowth of the bicycle tire. In fact, the first automobiles were equipped with Tandem weight bicycle tires. The first tire designed exclusively for automobile usage was made in 1896 by the B. F. Goodrich Company for the Winton Company of Cleveland, Ohio. Two sizes were furnished, 34 x 4 and 36 x 4 — the former for the front and the latter for the rear wheels of the machine. The carcass consisted of 19-plies of fabric and the «huge tires» were the source of much amusement for the crowds who witnessed the trial trips of Mr. Winton's «big» machine. To-day the pneumatic automobile tire is, by far, the most important single item of rubber goods manufacture. It is estimated that in 1919 37,500,000 tires were made, valued at $1,125,000,000. Practically all of this development has taken place since 1900; a wonderful record. There are two general types of pneumatic tires in use to-day. One is made with a carcass of specially woven long fibre cotton duck and the other is made with a carcass of rubberized cord. This latter type constitutes the acme in resilience and mileage and is much preferred by discriminating motorists.

Automobile accessories comprise such items as water buckets, blow-out patches, inner tube patches (self vulcanizing) and rubber mallets. While the volume in sales of these items is relatively small, yet, many such items are indispensible to the motorist.

The World War taxed the manufacturing capacity of the rubber companies to the limit. This together with the curtailment of crude rubber importation and curtailment in production of tires forced a more economical use of tires and with this a greater tire repair business. During this period, tire repairing received a greater impetus than in all the preceding years of automobile development. This led to an unprecedented demand for repair materials and there is every indication that tire repair materials as furnished by rubber companies will be an important division for all time to come.

Rubberized fabrics are used by the millions of yards in the manufacture of rubber surface water-proof coats such as worn by firemen, policemen and teamsters and also in the production of numerous special items such as typewriter, adding machine coverings, etc. The balloon business developed almost over night during the war, called for thousands of yards of rubberized fabric and this necessitated the installation of a great deal of special machinery. This machinery will be turned to other uses and it is predicted that the sale of coated fabric will extend to many new fields. As an indication of this, many automobiles are now using in place of leather, a leather substitute consisting of a fabric coated with a compound held by a binder of rubber. This material is really more durable and can be made in texture and colors surpassing in beauty and design those of leather.

Dipped rubber goods embrace such things as gloves, toy balloons, etc. The volume in sales in this line is not large and but few manufacturers have departments for the production of this class of rubber products. They are made by dissolving rubber in benzine and dipping mandrels in the solution. It is a particularly dangerous process on account of the fumes arising from the solvent and on this account not attractive to the big manufacturer of rubber goods.

Lathe cut goods embrace a great many items such as fruit jar rings, paper mill rolls, feed rolls and certain types of gaskets. These items, especially rubber rolls, both hard and soft, have been in use almost from the beginning of the rubber industry and while the field for usage in this division is somewhat limited, the volume is nevertheless attractive. Several hundred thousand pounds of rubber are used yearly in the making of jar rings alone.

Rubber thread, as worked out from the original idea of Nadier, is usually classified under sundries, although the quantities made generally call for a special department, for its manufacture. Millions of yards are used alone in the production of golf balls. And, in the manufacture of rubber thread for the elastic fabric industry, several hundred people are kept busy in one of Akron's factories.

The total world production of crude rubber has increased more than five fold in the last 20 years. While the production of native or wild rubber has declined considerably, that of plantation has increased since 1900 from a few tons to more than 300,000 tons per year. The bulk of all the crude rubber used now comes from the far eastern area, this embraces the Malay Peninsula, Strait Settlements, Ceylon and other islands. Out of the 290,000 tons used in 1918, 83 per cent came from this district and other plantation areas. Of the 256,879 tons used in the world in 1917, 177,088 tons were consumed by the United States — more than 69 per cent. Out of the 177,000 tons used in the United States, over one-third of this, or 60,000 tons came to Akron, justifying the claim that Akron is the rubber manufacturing centre of the world.

Less than 2,000,000 acres of the plantation areas are, at present, producing. More than 3,000,000 acres are now under cultivation and it is estimated that within four or five years the production of crude rubber on plantations alone will reach the astounding figure of 500,000 tons. Even with this enormous production of crude rubber, the factories would not have been able to keep going, were it not for the fact that three pounds of reclaim to one pound of new rubber are used. In other words, were it not possible to obtain great quantities of high-grade reclaimed rubber to use in places where it will serve the same purpose, the production in rubber goods would be far below what it is at present.

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**RUBBER INDUSTRY IN THE UNITED STATES.** The special census of manufactures for the year 1919 reported the number of establishments in the United States engaged in the rubber industry as 477. Of these, 15 were making rubber belting and hose; 25 making boots and shoes, and 437 in other lines — tires, packing, clothing, mats, matting, soles and heels, mechanical rubber, rings for jars, rubber thread, rubberized fabrics and hard rubber articles. In none of these lines was the product of less than $1,000,000 in value for the year.

The industry occupied 206,202 persons, of whom 158,549 were wage-earners. The total capital employed was $960,070,726. The value of the raw materials consumed was $594,343,590, and the value of the year's production was $1,138,216,019. Of the 437 establishments engaged in the general manufacture of rubber articles, 96 are in Ohio; 65 in New Jersey; 40 in New York and 47 in Massachusetts; the remainder being quite widely scattered throughout the country.

The values of the output in the larger branches of the rubber industry for 1919 are as follows:

| | |
|---|---|
| Automobile tires (casings) | $603,896,200 |
| Shoes and rubbers | 64,713,182 |
| Inner tubes for tires | 81,312,576 |
| Solid tires | 52,921,695 |
| Hose | 26,998,292 |
| Rubber boots | 26,066,647 |
| Belting | 22,436,242 |
| Druggists' and stationery sundries | 15,801,892 |
| Bicycle and aeroplane tires | 14,796,237 |
| Clothing, ponchos, etc. | 8,824,430 |
| Packing | 7,316,819 |
| Hard rubber goods | 34,383,231 |

The chief division of the rubber industry is the manufacture of tires, the value of its output amounting to over 60 per cent of the aggregate production of the whole. In 1919 there were 437 establishments devoted to this manufacture, 96 of these being in Ohio and 65 in New Jersey. The solid tire industry is centred in Ohio, where 86.6 per cent of the country's output is produced. The production of automobile tires for the year 1919 numbered 32,835,509 casings and 33,255,410 inner tubes; motorcycle, bicycle and aeroplane tires numbered 4,656,121, and solid tires to the value of $52,921,695 brought the total value of the tire output for the year up to $752,926,708.

The rubber industry experienced an enormous expansion during the war. Detailed figures covering this increase are not available, but some comparative idea may be gained from the amounts of crude rubber imported in 1918 as against the importations for 1914. In the calendar year 1914 the amount imported and consumed in the United States was 142,507,294 pounds, valued at $70,275,840. In the fiscal year ended 30 June 1918 the amount was 390,338,533 pounds, valued at $203,122,748. Exports in 1914 amounted to a value of $14,767,513; of which total tires of all descriptions accounted for $4,963,270; boots and shoes, $2,780,325, and belting, hose and packing, $1,807,848. In 1923 the value of the exports was $37,964,988; of which $17,544,649 represented automobile pneumatic casings; $322,563 other tires, $1,925,197 pneumatic tubes; $1,978,034 solid tires for automobiles and motor trucks; $1,735,006 rubber belting; $1,620,790 rubber hose; $1,156,951 rubber thread; $3,024,234 canvas shoes, with rubber soles; $717,970 rubber boots; $722,312 rubber shoes; $155,792 battery jars and accessories; $121,143 other rubber electrical supplies; and $449,778 other hard rubber goods.

**RUBBER TIRES.** The earliest mention of rubber tires in literature is contained in a work by Thomas Hancock published in 1856, in which he suggests the use of rubber tires on vehicles for the purpose of avoiding vibration. Prior to this, however, a patent for an elastic tire had been granted to Robert William Thompson in 1845, and it has been frequently suggested that this patent anticipated the pneumatic Dunlop tire. As a matter of fact, it appears to have been satisfactorily proved that Dunlop's invention was developed quite independently of any knowledge of Thompson's work. Thompson's tire consisted of an elastic belt made of a number of folds of canvas saturated and covered on both sides with rubber or gutta-percha in a state of solution. The inner tube so obtained was to be protected by a cover built up around the tire, made by riveting together circular segments of leather and bolting these to the tire. There was also provision by means of a pipe passing «through the tire» for inflating with air. As far as can be ascertained, very little practical use was made of Thompson's invention. In 1856 a solid tire composed of cloth or other fibrous material and rubber sheet in alternate layers was made by W. Coles Fuller. This tire was made up on a cylinder fastened to the wheels by means of flanges. The introduction of the bicycle about 1869 gave the necessary impetus for the further development of the solid tire and subsequently of the pneumatic type. In 1888 the pneumatic tire as we know it was invented by Dunlop and at once came into universal use on the bicycle. In England and on the Continent, an outer casing containing an inner inflated tube was attached to the wheel-rim, while in America a single tube cemented to the rim was more generally used and to this day holds its place on the bicycle. With the advent of the automobile a new field opened for the pneumatic rubber tire. The simplest form of automobile tire is a solid band of rubber, next come the several forms of cushion tires in which the band of rubber is perforated with a number of small holes or provided with a series of openings with the object of obtaining greater resiliency and of making the tire more yielding than the solid rubber type. Solid tires are to-day practically confined to commercial and industrial vehicles, such as delivery trucks, wagons, etc. The great weight and speed of passenger automobiles and their delicate construction require additional protection from vibration to that furnished by springs alone. The pneumatic tire is now in general use on such vehicles, for with these tires the car is suspended in air, which is the most elastic of substances. The most common form of tire is composed of a hollow rubber tube of circular section filled with air and protected from wear by means of an outer shoe or casing. The inner member or tube is made of a very pure rubber, about one-eighth inch thick for cars of average weight. While this tube is very elastic and is air-tight, it would not be strong enough or have adequate resistance to be run directly in contact with the road surface, therefore, it is necessary to protect it by a shoe composed of layers of fabric and rubber composition. The shoe member is provided with beads on its inner periphery designed to interlock with the rim channel. A steel rim is placed around the felloes of the wheel and shaped to fit the shoe or casing, its exact shape depending on the design of the tire. The part of the shoe which comes in contract with the road surface is called the tread. The main part of the shoe or casing is made up of five or more layers of a Sea Island cotton fabric «frictioned» with high-grade rubber composition. This is forced into the mesh of the cloth by machinery so the fabric will be practically waterproof and will join intimately with the other plies by a process of vulcanization when the shoe is cured. Outside of the fabric body a layer of very resilient rubber, approximately of crescent form, known as the padding, is provided to give elasticity to the shoe. Between this member and the tread a number of piece of heavy fabric called «breaker strips» a interposed to offer a certain degree of resistance to any sharp object that might penetrate the tread and go through the padding and into the fabric body. The tread is the tire part subjected to the greatest stress, as it must resist the abrading influence of the road, and, in the case of the rear tires, the wearing effect of the friction of the tractive effort. The tread, accordingly, is of very tough rubber composition and does not possess a very great degree of elasticity, which is here sacrified for strength and resistance to wear. Air is pumped into the tire through a form of automatic valve, firmly attached to the inner tube and projecting through the steel rim and felloe. The valve is held in its seat by a tension spring, and opens only when the pressure of the incoming air is greater than the pressure within the tube. Tires are sometimes classified according as they have a smooth tread or a non-skid tread. The non-skid type has a roughened surface, either small cups, knobs, steel rivets, etc., designed to prevent skidding on slippery highways. Chains are also used for the same purpose, being so made that they are quickly attached or detached, as the necessity arises. Their form is too well known to require description. The casing or shoe of automobile tires differs also in the manner of their seating or attachment to the rim. The clincher type was long the most popular and simplest in that the shoe was held against the rim when the tube is inflated. Another form is known as the straight-side. All these varieties are designed to facilitate a more ready removal from the wheel or to make for a more secure attachment. The quick detachable rim is the more modern and popular type. It is permanently fastened to the felloe of the wheel, but the outer clinch of the rim is removable, permitting the casing to be easily pulled off. American tire manufacturers have adopted the following proportions between axle loads and tire sizes:

| | | | | |
|---|---|---|---|---|
| 2½-inch tires, all diameters | 225 | pounds | per | wheel |
| 3 inch tires, all diameters | 350 | “ | “ | “ |
| 3½ x 28 | 400 | “ | “ | “ |
| 3½ x 30 | 450 | “ | “ | “ |
| 3½ x 32 | 555 | “ | “ | “ |
| 3½ x 34 | 600 | “ | “ | “ |
| 3½ x 36 | 600 | “ | “ | “ |
| 4 x 32 | 650 | “ | “ | “ |
| 4 x 34 | 700 | “ | “ | “ |
| 4 x 36 | 750 | “ | “ | “ |
| 4½ x 34 | 800 | “ | “ | “ |
| 4½ x 36 | 900 | “ | “ | “ |

The air pressures for inflating pneumatic tires recommended by the same authorities are as follows:

| Diameter of tire, inches | Maximum weight on wheel, lbs. | Air pressure in tire, lbs. pr. sq. in. |
|---|---|---|
| 2½ | 225 | 50 |
| 3 | 350 | 60 |
| 3½ | 600 | 70 |
| 4 | 750 | 80 |
| 4½ | 1,000 | 90 |
| 5 | 1,000 | 90 |

In recent years cord tires have come into favor because of their lasting qualities. They have a carcass of rubberized cord instead of the well-known fabric laps. Consult Goodrich Rubber Company's ‘Wonder Book of Rubber’ (Akron, Ohio, 1917) and Dykes, ‘Automobile Encyclopedia’ (Saint Louis, annually).

**RUBBER-TREES,** the sources of caoutchouc (q.v.) or India-rubber (q.v.) are botanically various and widely distributed in the warmer parts of the world. They belong to the four allied groups *Moraceæ, Euphorbiaceæ, Artocarpaceæ,* and *Apocynaceæ,* but not all the members of these families yield caoutchouc, while a similar juice may be obtained from certain outside plants. This substance (latex) is one of those, like the «milk» of the milkweeds and many others, which are elaborated in the green surface cells and conducted through the plant, for its nourishment by the lactiferous canals. In the rubber plants they run just beneath the bark and often carry the sticky juice in excess, so that «in the gigantic trunks of tropical fig-trees,» as Kerner says, «the latex often wells up in large quantities from rifts in the bark which have arisen spontaneously and thickens into long strings and ropes of India-rubber hanging down like a mantle.» A rough test of whether a tree-juice has the true properties of caoutchouc is to rub some of it between the fingers until it exhibits the recognized elastic threads; inferior juices of other trees are sometimes mingled with it by native gatherers as adulterants and these may in some cases nearly ruin the whole package, by developing other qualities in coagulation, as for instance those of gutta-percha (q.v.).

The caoutchouc-yielding trees occur in all tropical regions, but are different botanically in each region. The principal commercial supply and the best is obtained from the valley of the Amazon and is known to the trade as Pará rubber; but all other ports of northern South America ship it in large quantities. That which comes from the valleys of the Amazon and Orinoco (Brazil, Guiana and Venezuela) is chiefly the product of the euphorbiaceous genus *Hevea* and especially of *H. brasiliensis,* a tree often 60 feet in height, branching from the base, which, with two or three similar species, grows abundantly in the hot steaming lowlands along the river courses; the juice is obtained by tapping the trees by means of incisions in the bark in the evening and collecting the deposition next morning. Each tree will yield about six ounces in three days and then must be allowed to rest. The main resources in Guiana are the species *H. guayensis* and *paucifolia,* the former of which is called by the natives «caoutchouc.» That exported from Maranhão is similar. The Cearà rubber is derived from a smaller euphorbiaceous tree (*Manihat glaziovii*), which grows over a large area in that part of Brazil and is tapped when about two years old. The Pernambuco or Mangabeira rubber is the product of a small, drooping tree (*Hancornia speciosa*) of the family *Apocyonaceæ,* which grows on the hills and yields the edible fruit «mangaba,» for the sake of which it is frequently cultivated in orchards. This is a comparatively poor sort of rubber. Nearly all the crude rubber above mentioned is exported to Europe. The United States derives its supply mainly from Colombia, Ecuador, Central America and Mexico. This is mainly the product of a tree (*Castilloa elastica*) of the family *Artocarpaceæ* related to the breadfruit. It is a lofty tree, with a trunk sometimes three feet or more in diameter and large, hairy, oblong leaves, which grows in the rich soil of wet, low-lying, heavily forested valleys. With some allied species it flourishes from Mexico and Cuba to the mountains of

Venezuela and the Andes, which separate it from the heveas of Brazil. It reaches its largest size and best condition in Panama and Nicaragua. Honduras rubber is good, but some of that from Guatemala is inferior.

The Asiatic supply comes from various ports in Assam (via Calcutta), and eastward to Borneo and is chiefly produced by the rubber-fig (*Ficus elastica*). A large variety of other plants and trees in the Malayan and Papuan region yield rubber, some of which is excellent and of growing importance commercially, and everywhere the early rough and wasteful methods of obtaining the product are being corrected. It is also obtained in northern Australia, in Fiji and in various neighboring islands. More than 100 different trees are known to give rubber-making juices in commercial quantities, while in a great many others, as lettuce, poppy, milkweed and others, it is present in small quantities. The juice of the Brazilian *Hevea* trees is said to yield about 30 per cent of pure rubber; but a product of less than 15 per cent is not regarded as commercially profitable.

Africa is now the principal source of the wild rubber supply of the world next to Central and South America. The bulk of that from the west coast and equatorial region is obtained from various climbing shrubs belonging to or allied to the apocyonaceous genus *Vahea*, few of which are well known to botanists. In Liberia and somewhat elsewhere are rubber-bearing figs; and a large part of the extensive product of Madagascar and the Mozambique coast is derived from a *Walbergia*, species of which also give much of the caoutchouc received from the Malayan Islands.

**Cultivation of Rubber Trees.**—Attempts have been made in most countries, where suitable conditions prevail, to propagate the rubber trees in plantations of prescribed dimensions, and capable of rational supervision by experts, rendering the planter independent of native delinquencies and assuring annual crops of first quality for an indefinite number of years. It has been demonstrated that the rubber tree can produce, under proper management, a regular and increasing crop, for each year of its natural life, without being injured. Many thousands of acres of rubber are rapidly being developed in Mexican plantations in the tropical coast lands from the country round the Isthmus of Tehuantepec southward into Guatemala. Progress has been retarded on account of lack of previous knowledge or precedent in the business, yet the difficulties seem to have been surmounted, and it is now demonstrated that the rubber tree can be artificially cultivated when conditions under which its growth is stimulated are understood. In Chiapas, the numerous river bottoms afford the character of soil required, favorable atmospheric conditions and abundance of rain-fall. The rubber lands of this region are covered with thick tropical forest growth, which it is necessary to clear. The rubber tree shoots, raised from seed in neighboring nurseries and about a foot high, are planted in the clearings generally to the number of 200 trees to the acre. At six years of age the tree is tapped, yielding a small first crop. Hundreds of thousands of every age are growing in strength and luxuriance, with a prospect of affording an ever-increasing supply of the crude product annually. The Central American rubber tree will not flourish in swamps, though moisture is a prime requisite. Hence the saying: «A rubber tree must have its feet dry and its head damp.» Extensive experiments have been made with various kinds of rubber plants; but the Castilloa has been found to be the best adapted to soil and other conditions obtaining in Mexico and Guatemala. Rubber can be grown in commercial quantities in practically all the states of southern Mexico, where it is sometimes cultivated near the extreme limit of 3,000 feet above sea-level. However the best rubber trees grow there at from 300 to 1,000 feet altitude. The altitude it affects varies in different lands, preferably but little above sea-level, but in some localities 1,000, 1,500, or even 3,000 feet above tide water. The rubber plant so commonly grown as an ornamental house plant is the East Indian fig (*Ficus elastica*).

In the extensive plantations of Ceylon, where the growing of rubber for several years has been a commercial success, efforts have been directed to the cultivation of the Pará variety, which has proven almost as successful there as in its native place. In the Malaya Peninsula excellent cultivated rubber is now being marketed yearly in continually growing quantities. But notwithstanding these successful efforts at the cultivation of rubber trees, fully half the rubber used comes from the forests of South and Central America and guayule plains of Mexico in 1914, and the market was still ruled by the price of the best Brazilian rubber. Cultivated rubber has rapidly come to have a very important part in supplying the market. In 1890 there were practically no rubber plantations in existence. In 1900 the rubber plantations were just beginning to produce enough rubber for experimental purposes; and three years later Ceylon exported 41,684 pounds, which had grown to almost 25,000 tons in 1916. British Malaya has also become a great rubber-producing country with over 800,000 acres planted to rubber trees. The report of the importations into the United States show the wonderful growth of cultivated rubber. The imports had increased from about 30,000 tons in 1904 to over 86,000 tons in 1915. Of the latter more than 50 per cent came from rubber plantations in the Orient and Mexico. Owing to the fact that scientific methods are now being used in the tapping of plantation trees and the care of the rubber obtained therefrom, cultivated rubber now brings, in the open market, from 25 to 50 per cent higher prices than the best Pará wild rubber. In 1916 the total world crop of rubber was about 200,000 tons or over 50,000 more than that of the preceding year; and this increase was due to the constantly increasing output of the rubber plantations. From 1914 to 1916 the rubber supply from Ceylon and India increased from 15,000 to 25,000 tons; that of the Malaya Peninsula and adjoining lands from about 50,000 to over 105,000; while that of South America remained stationary. During the same period the output of the Kongo, French Kongo and Sudan rose from 3,900 to over 5,000 tons; while that of the rest of Africa decreased from 4,600 to about 2,000 tons. The import figures show that over 65 per cent of all the rubber marketed in 1916 came from cultivated rubber plantations. This is very suggestive. But the facts are even more in favor of the cultivated rubber which reaches the market almost pure while the wild variety contains from 20 to 25 per cent impurities, which considerably increases the percentage of cultivated rubber marketed. At the beginning of 1917 the following was the number of acres planted to rubber trees in the Orient: Ceylon, 230,000; Malaya (Malaca, etc.), 600,000; Borneo, 30,000; Dutch East Indies, Java, Sumatra, etc., 500,000; India and Burma, 40,000; German colonies, Samoa and West Africa, 12,000. In addition to these there are probably 50,000 acres planted in Mexico and Central America, if not more. Owing to the revolutionary condition of the country and the difficulty of obtaining labor the rubber plantations of Mexico produced little rubber for export simply because the rubber was not taken from the trees. But there are in southern Mexico some plantations containing from 5,000 to 20,000 acres, on some of which are trees from 10 to 20 years of age. Consult Akers, C. E., ‹The Rubber Industry in Brazil and the Orient› (London 1914): Brown, H., ‹Rubber, its Sources, Cultivation and Preparation› (London 1914); Locke, R. H., ‹Rubber and Rubber Planting› (New York 1914).

**RUBBLE WORK.** See Masonry.

**RUBEFACIENTS,** substances or agents which, when applied for some time to the skin, occasion a redness and increase of heat. When the irritant effect of any agent amounts to blistering, or causes discharge of pus or matter, the action is said to be vesicant or suppurative. All these agencies are included under the one term counter-irritants, the rubefacient action being the mildest of the three, and dependent generally upon the form and duration of the application; as, for instance, mustard or ammonia may be used so as to produce only the most transient redness, or may be made to cause blistering or suppuration. Among the most commonly used rubefacients are hot water, ammonia, mustard, oil of turpentine, powdered ginger, spirit of wine, camphor and chloroform vapor.

**RUBELLITE,** the red or deep pink variety of tourmaline (q.v.); when transparent, valued as a gem.

**RUBENS,** roo'bĕnz, **Peter Paul,** Flemish painter: b. Siegen, Westphalia, 29 June 1577; d. Antwerp, 30 May 1640. He was (or, according to some, at Cologne) of good citizen family who had gone from Antwerp to Cologne on account of religious oppression, and who, while there, had become the steward of Anne, wife of William of Orange-Nassau, the famous liberator of the United Provinces. He was compelled to remove to Siegen, a small town, because of offenses committed, and it was not until his death in 1588 that the widow was able to return to Antwerp. There the boy studied in the Jesuit College and was page to a lady of rank. He studied art first with Tobias van der Haegt, and afterward with Adam van Noort, but his chief master was Otto van Veen (called Otto Vaenieus). With this artist, who was court painter to the Regent of the Netherlands under Spain, the Infanta Isabella Clara Eugenia, Rubens remained from 1596 to 1600; and at the end of that period of time went to Italy. It is evident that he had the best introductions; and yet the young man's courteous manners and liberal training, as well as his great ability as a painter of portraits, must have made him welcome at once.

At Venice he met the famous and magnificent Duke of Mantua, Vincenzo Gonzaga, who at once employed him, sending him first to Rome, placing him near his own person at his own palace in Mantua, and sending him to Spain in 1603. While in Mantua he painted the famous triple altar-piece for the Prince's chapel: a work of which the greater part of the middle composition is in the church of Saint Trinita in Mantua, one wing at Nancy in the Provincial Museum, and one at Antwerp. It was not until 1608 that he returned to the North, finding his mother dead on his arrival; and settled in Antwerp, his home from that time. It was then that he painted the first of the two wonderful pictures which are in the cathedral of Antwerp, the ‹Raising of the Cross›; and two years later, for the company of the Arquebusiers, its companion, the famous ‹Descent from the Cross,› which is in itself a perfect embodiment of Rubens' art. He married, and now having property, both from his own inheritance and labor, and in right of his wife, bought land and built himself a house, of which drawings remain and in which he lived for 30 years in the fashion of a very wealthy burgher; though having, through the practice of his art, unusually close relations with the Infanta's court and the nobility, both Spanish and Flemish. It was in this capacity that he went to Spain on a mission for his patroness, the regent of the Netherlands, and her husband, the Archduke Albert of Austria, and was sent from Spain to England by the famous Minister, Olivares. It is not to be forgotten that he was looked upon as a subject of the Spanish monarchy, and that in his capacity as a good Catholic he would have felt no objection to this view of the case, though he never took sides strongly against the Protestant rising of many of his countrymen. In England he was knighted by King Charles I. Finally in 1630, being then in his 54th year, he returned to Antwerp and married a second time. From this time onward his art employed him almost incessantly, in spite of a short intervention due to religious divisions between the northern and southern provinces; and his fame and popularity increased until his death in 1640 in Antwerp. His ‹Portrait of Marquis Ambrose de Spinola› is owned by Henry C. Frick of New York.

Few artists have had so varied a career, with so many other subjects of high interest to interfere with the peaceful pursuit of their art; and yet few artists have approached Rubens in the amount of artistic work done. This is to be accounted for in part by his extraordinary skill and success in assimilating the work of his many assistants (their names are those of men afterward famous in their art, chief among them Jordaens and Van Dyck); but partly also by the almost unexampled facility of work which he gained and which remains unique in the records of the art of painting. In his earlier days he copied great numbers of paintings by Italian masters, as was the custom then, and there can be no doubt that his facility and range were greatly increased by this practice. His work done after the age of 30 is uniformly wonderful for his power over all his materials, and all the different processes which enter into painting on a large scale. The fresh and rosy scheme of color which he adopted must have been natural to his instincts; original with him and not derived: moreover, his strong and intelligent drawing, though gained by practice in many schools, was still his own creation. His tendency to excess of action and to the appearance of violence, as in the famous 'Fall of the Rebel Angels,' in Munich, and many similar works, does not seem to imply a headlong or self-forgetful mood; he seems to have been always master of himself, and his paintings were always popular (that is, in sympathy with his times), in style and management. He became in this way the typical artist of his epoch and the most admired master, the man chosen for great state undertakings in art as well as in diplomacy. It was in this capacity that he was employed by the Queen Dowager of France, widow of Henry IV, to decorate her palace of the Luxembourg in Paris, and the great paintings which are now in the new Hall of Rubens in the Louvre were prepared for that purpose. Studies for them are at Munich.

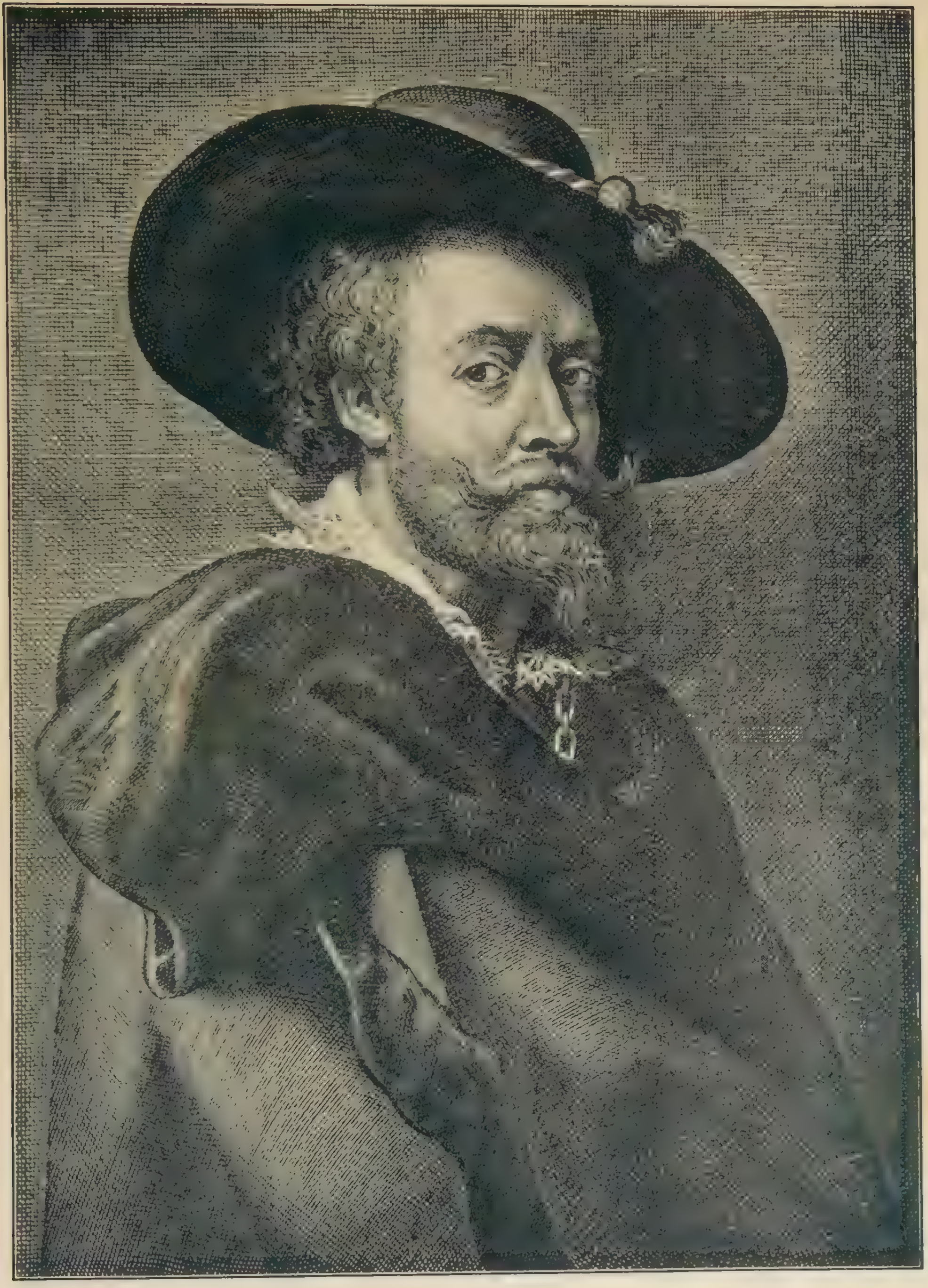
All the treatises on Flemish painting deal with Rubens, and the dictionaries of artists give him much space. The most important books devoted to him are those by Max Rooses 'Life of Peter Paul Rubens' (Antwerp 1903; Eng. trans., 2 vols., Philadelphia 1904), and by Emile Michel, translated into English as 'Rubens, his Life, his Work, and his Time' (2 vols., New York 1899). This book is very richly illustrated. The collections of artists' biographies do not always contain Rubens' biography; but an excellent life of him by Charles W. Kett is included in the series called 'Illustrated Biographies of Great Artists' (1878–79). There are many books published in Belgium, either in French or in Flemish, which deal with the different stages in his remarkable career, and some of these are readily accessible. The essay on Rubens in 'Great Masters' by John La Farge (New York 1904) is of great critical value. The *Gazette des Beaux-Arts* has several important papers with elaborate illustrations. Consult also his correspondence published as 'Codex Diplomaticus Rubenianus' (Antwerp 1887–1909); Calvert, G. H., 'Life of Rubens' (Boston 1876); Gachard, L. P., 'Histoire de P. P. Rubens' (Paris 1877); Hortica, L., 'Rubens: the Story of His Life and Work' (New York 1916); Knackfuss, H., 'Rubens' (New York 1904); Rose, G. B., 'Renaissance Masters' (3d ed., ib. 1908); Stevenson, R. A. M., 'Peter Paul Rubens' (New York 1909); Dillon, E., 'Rubens' (1910).

**RUBIACEÆ**, a well-marked family of plants, almost exclusively found within the tropics. The leaves are simple, entire, opposite, with interpetiolar stipules. The flowers are usually arranged in panicles or corymbs. The calyx is adherent, with a definite number of divisions or none. The corolla is superior usually tubular and regular, with a definite number of divisions. The stamens arise from the corolla, all on the same line, and alternate with its segments. The ovary is inferior, surmounted by a disc, usually two-celled, occasionally with several cells; the style is single, sometimes partly divided; the stigma usually simple, sometimes divided into a number of parts. The fruit is inferior, dividing into halves, or not dividing, and dry or succulent; sometimes it is many-celled. Many of the species of this family are of considerable importance, being largely used in medicine, acting as tonics, febrifuges, emetics and purgatives. The species of *Cinchona* yield Peruvian bark. An extract, with some sweetness and a more astringent taste than terra japonica, and called by the Malays gambier, is obtained from *Uncaria gambir*. Ipecacuanha is the root of *Cephäelis ipecacuanha*, a little, creeping-rooted, semi-herbaceous plant, found in the damp forests of tropical America. Coffee is the seeds of a plant of this family, *Coffea arabica*. A few species bear an edible fruit, such as the genipap of South America, the nahil peach of Sierra Leone and the voa-vanga, a good dessert fruit in Madagascar. Among dyeing plants there is *Oldenlandia umbellata*, whose roots are the chay-root (q.v.) of commerce.

**RUBICON**, roo'bĭ-kŏn, the ancient name of a river in Italy of some celebrity in Roman history. Cæsar by crossing this stream, at that time regarded as the northern boundary of Italy, finally committed himself to the Civil War. Hence the phrase, «to pass the Rubicon,» means to take the decisive step by which one commits himself to a hazardous enterprise. It is very doubtful under what name the Rubicon now exists, the honor being claimed by two streams — the Fiumicino and the Luso.

**RUBIDIUM**, a rare metal discovered by Bunsen and Kirchhoff in 1860, by means of spectral analysis, in the residue obtained by evaporating a large quantity of the mineral water of Dürkheim, Germany. The metal and its salts exhibit two dark red lines in the blue part of the spectrum — hence the name, from the Latin *rubidus*, «dark red.» Rubidium has the atomic weight 85.4, and the symbol Rb. It is a white, shining metal, having a specific gravity of 1.52; at ordinary temperatures — even so low, indeed, as — 10° C. — it is soft as wax; it is easily oxidized; when thrown on water it decomposes that liquid with evolution of hydrogen, which takes fire because of the heat produced in the reaction. Rubidium forms one of the metals of the alkalies, being analogous in its properties with potassium and sodium; its compounds also closely resemble those of these metals; thus it forms a characteristic hydrate (RbHO), which is a white, solid substance, feeling unctuous to the touch, deliquescing in the air, and dissolving in water to form a strongly alkaline liquid. Rubidium forms one chloride (RbCl), bromide (RbBr), and iodide (RbI), and in all its compounds comports itself in a manner precisely analogous with potassium and sodium.

**RUBINOW, Isaac Max**, American economist and statistician: b. Grodno, Russia, 19 April 1871. He came to the United States in 1893, was graduated at Columbia University in 1895, and took his M.D. at New York University in 1898. He engaged in the practice of medicine in 1898–1903, afterward adopting economics as a profession. In 1904–11 he was



PETER PAUL RUBENS

economical and statistical expert in the United States Department of Agriculture and the Department of Commerce, and later became statistical expert for an insurance company until 1915 when he became director of the social statistics department of the board of public charities of New York. He is well known as a writer on Russian economics, social insurance and Socialism. Author of ‘Russia's Wheat Surplus’ (1906); ‘Economic Condition of the Jews in Russia’ (1908); ‘Russia, Spain’ (1911); ‘Social Insurance’ (1913); ‘Was Marx Wrong?’ (1914); ‘Standard Accident Table’ (1915); ‘Standards of Health Insurance’ (1916), etc.

**RUBINSTEIN**, roo'bĭn-stīn, **Anton Gregor**, Russian composer and pianist: b. Wechwotynez, 28 Nov. 1829; d. 20 Nov. 1894. His parents were Jewish and soon after his birth removed to Moscow. His mother, being a good musician, was his first teacher; he next studied with Villoing, a Frenchman, and at nine played in a concert at Moscow. He accompanied his teacher to Paris, where in 1840 he played before the most distinguished musicians. He was advised by Liszt to study in Germany and after a concert tour in England, Holland and elsewhere, he settled in Berlin to study theory under Dehn. He returned to Russia in 1848, settling in Saint Petersburg. In 1855 he was enabled to visit Germany again for study; here also he succeeded in finding publishers for his compositions, and made concert tours that extended to London and Paris. In 1858 he was again in Saint Petersburg, where he was appointed court pianist; in 1859 he became director of the Russian Music Society and in 1862 founded the Saint Petersburg Conservatory, and was director until 1867. He made concert tours in Europe in the following years and appeared in America in 1872–73. As a piano player he occupied the front rank; in perfection of technique he had few peers and was excelled by none. As a composer he was prolific, brilliant; but showed a lack of self-discipline which prevented his compositions from attaining the highest merit. He wrote songs; his best-known works are the Ocean operas, pianoforte pieces, orchestral scores and Symphony and the pianoforte concertos in G major and D minor and the trio in B-flat. His operas, such as ‘The Maccabees’ (1875); ‘Paradise Lost’ (1875); ‘Sulamith’ (1883), had but a partial success.

**RUBLE**, roo'bl, or **ROUBLE**, a silver coin, the standard of money in Russia, containing 278 grains of fine silver, and equal to about 76 cents in American money. In actual circulation there is little but paper money, valued at from 10 to 20 per cent below its nominal value. A ruble is divided into 100 kopecks. Half and quarter rubles, and 5th, 10th and 20th parts of a ruble, are coined in silver; gold coins of the nominal value of three rubles (the Imperial ducat) and five rubles (the demi-Imperial) are also coined.

**RUBNER**, rụ̈p'nėr, **Cornelius**, Danish musician and educator: b. Copenhagen, 26 Oct. 1855. He studied under Gade Hartmann at Copenhagen, Reinecke and David at Leipzig, and afterward under Hans von Bülow and Rubinstein. He was for many years a professor of music, court pianist and conductor of operas and concerts in Germany. Since September 1904 he has been head of the music department at Columbia University, New York. Author of ‘Prinz Adzor’; a symphonic poem ‘Friede, Kampf und Sieg’ and many piano pieces, songs, etc.

**RUBRIC** (Lat. *ruber*, red), was the name applied to those portions of old manuscripts and books which, for typographical embellishment or on account of their importance in the text, were printed in red ink. Often, as in the old monastic manuscripts, only initial letters in the paragraph were so treated. With the development of the copyist's art, however, rubified manuscripts became ornate; the initial letter of every noun, perhaps, was rubricated, chapter headings, thumb-nail indexes, marginal comments, and in cases whole passages of the text were highly ornamented rubrics.

The use of the red letter text became common in the case of religious treatises, and so certain rules and directions in prayer books, explanations and responses are printed in red ink. This is the case with the Roman missal, where the matins, lauds, beatifications, etc., are always in red, and in the liturgy, where the directions for the performance of the service are also in red. In the old Bibles the chapter heads were so treated. Modern typography discards such profuse use of colored ink and usually substitutes in its place type of a different face from the rest of the text, but the portions thus emphasized are still called rubrics.

Spanish custom has given another significance to the word, and in Spanish denotes the flourish so common after Spanish signatures. This likewise results from the fact that the rubrics were the most conspicuous features of a page.

**RUBRUQUIS**, rụ̈'brụ̈'kēs, or **DE RUYSBROEK, RUBROUCK, RYSBRUCK,** Friar **William of,** mediaeval traveler and author: b. Rubrouck, French Flanders, about 1215; d. about 1270. He was a contemporary and brother Franciscan of Roger Bacon, but little is known of him except what can be culled from his own writings and from Roger Bacon's mention of him in his ‘Opus Majus’; he is mentioned also in the records of the Franciscan order, and it is now clear that he was born in France instead of in Brabant as was formerly supposed. In 1253 Louis IX (Saint Louis) sent him with two other friars on a special but informal mission to Tartary to spread Christianity and to treat with the Tartar prince, Sartah, son of Batu; the king having heard that the prince had embraced Christianity. He set out by way of Constantinople, landed on the Crimean coast and proceeded by means of horses and carts to the courts of Sartah and Batu, crossing the river Don and reaching the Volga. He was then sent by Batu to the Great Khan in Mongolia, a journey of great hazard, and returned through Persia and Asia Minor. He reached home in the late summer of 1255, having traveled nearly 11,000 miles. His report of the journey, written for Louis IX, is considered one of the finest travel narratives in existence. While the Latin in which it is written is not scholarly it sets forth in vivid style the geography, ethnography, manners, customs, religion and language of the region traversed, and shows irrefutable evidence of a keen, accurate, honest and highly intelligent observer whom time has failed to discredit. Five manuscript copies of the narrative are known to be in existence, the most important being the one at Cambridge and two at Leyden. Portions of the narrative were published by Hakluyt (1598–99), but it was not until 1839 that a full edition of the text was published by the Paris Geographical Society in ‹Recueil de Voyages› (Vol. IV). There is no adequate commentary on the subject matter. There are, however, two useful editions published by the Hakluyt Society, ‹William of Rubrouck . . . John of Pean de Carpine,› translated and edited by W. H. Rockhill (London 1900), and ‹Texts and Versions of Carpini and Rubruquis,› edited by C. Raymond Beazley (London 1903). Consult also Schmidt, F. M., ‹Uber Rubruk's Reise› (Berlin 1885); D'Ohsson, ‹Histoire des Mongols› (1852); Bretschneider, ‹Mediæval Researches from Eastern Asiatic Sources› (1888); Beazley, ‹Dawn of Modern Geography› (1906).

**RUBUS**, a genus of plants of the family *Rosaceæ*, of which more than 1,500 species have been described. They are mostly natives of the northern hemisphere and are especially abundant in Europe. About 100 are indigenous to North America. They are mostly shrubs whose stems (canes) are biennial or annual, prickly, erect, curving, climbing or trailing. They have simple or compound alternate leaves, white or pink flowers usually in corymbs or racemes, followed generally by compound fruits consisting of many drupelets. In the blackberry the drupelets are united to the receptacle; in the raspberry they are not. Besides the raspberry, blackberry and dewberry (qq.v.), many species are useful for food or ornament. Among the best known are the European bramble (*R. fruticosus*), wineberry (*R. phœnicolasius*), flowering raspberry (*R. odoratus*), and the cloudberry, yellowberry, bake-apple berry (*R. chamæmorus*). The Rocky Mountain flowering raspberry (*R. deliciosus*), the brier rose, bridal rose or strawberry-raspberry (*R. roseæfolius*), and *R. cratægifolius* are well-known ornamental species in shrubberies, etc. See BLACKBERRY; RASPBERRY, etc.

**RUBY**, the rich red, transparent variety of corundum, having a hardness of nine and a specific gravity of four. The name is sometimes used for other red gems (see RUBY SPINEL), and improperly for richly colored garnets, of the variety pyrope. The stones called Cape rubies and Arizona rubies are only fine pyropes, coming respectively from the South African diamond mines and from Arizona and New Mexico. (See PYROPE). Siberian ruby is a term sometimes applied to gems of rubellite or red tourmaline (q.v.), and Brazilian ruby to the deeper shades of pink topaz, altered to that color by heat. The true rubies recently mined in the Cowee Valley, in North Carolina, have attracted much interest, being in some cases as fine as those from Burma; but they are mostly small, and it is not certain whether they will prove of real importance. They occur in a greatly decomposed igneous rock, in the same manner as the very similar crystals of sapphire from Yogo Gulch, Montana. The rubies of Burma, formerly spoken of as Pegu, are derived from a crystalline limestone. In these cases, and indeed generally, the gems are largely found in gravels and surface deposits formed from the decomposition of the parent rocks. True rubies of large size are very scarce, so that one of three carats weight, flawless and of good color, is worth much more than a diamond of the same size. Like all the deeply-colored corundum gems, rubies are strongly dichroic, their color varying with the direction in which light traverses the crystal, whether transverse or parallel to the axis of the prism. The presence of microscopic cavities or of included crystals of extreme minuteness, disposed in a certain parallelism to the crystalline axes, produces the optical effect known as asterism, which is exhibited by the highly prized gems called star rubies (and star sapphires). In less amount or when irregularly distributed, the same causes produce defects known as «silk,» and cloudiness. Many efforts have been made to produce the ruby by chemical means, and a dozen or more processes have been devised with greater or less success within the past 50 years, but with little practical result. Crystals have been obtained, of fine color, but mostly small, or in flat hexagonal plates too thin to furnish gems. Some years ago larger pieces appeared in the market that caused some concern from their close resemblance to natural rubies. The process was not made known, but was judged to be that discovered by Frémy and Feil, by fusing an aluminate of lead with silica. They were detectable by the microscope, which showed that they contained minute cavities that were rounded and bubble-like, while those in real rubies are angular and crystalline. The French «Syndicate of Diamonds and Precious Stones» decided that all such rubies must be sold as «artificial,» under penalty of fraud.

**RUBY MATRIX**, is a name recently given to a beautiful combination of red or pink corundum with a bright green variety of hornblende (amphibilite) found at the Cullakenee corundum mine in Clay County, North Carolina; it has been proposed to use it as an ornamental stone, though the ruby-corundum is not transparent enough to cut gems.

**RUBY SPINEL**, this mineral is an aluminate of magnesia. It crystallizes in octahedrons, with a hardness of 8 and a specific gravity of 3.5 to 3.7, usually of some shade of red, sometimes very rich, and transparent to translucent. Fine specimens make beautiful gems, known as spinel rubies, not readily distinguishable from true (corundum) rubies, though less hard, less dense and less valuable. The historic «Black Prince» ruby, in the crown jewels of England, is believed to be a spinel. True rubies may also be distinguished from spinels by the dichroism which belongs to all the deeply colored corundum gems. Red spinel has several other varieties, with special names; it is called Balas ruby when the color is rich pink, rubicelle when it inclines toward an orange red, almandine ruby when it tends toward a purplish. Spinel is a frequent associate of the true ruby in Burma, Siam, Ceylon, etc. It usually occurs in crystalline limestones, though it is occasionally found in other metamorphic, and even in volcanic rocks.

**RUBY-THROAT.** See HUMMING-BIRD.

**RÜCKER**, rük'ėr, Sir **Arthur William,** English scientist and educator: b. 23 Oct. 1848; d. 1 Nov. 1915. He was educated at Brasenose College, Oxford, and was a Fellow there in 1871–76. He was professor of physics at the Royal College of Science, London, in 1886–1901; and was principal of the University of London in 1901–08. He was secretary of the Royal Society in 1896–1901; received the Royal Society's Royal Medal in 1902, and was knighted in that year. He was connected with various important official commissions for the advancement of university education. He was joint author of ‹On the Expansion of Sea Water by Heat› (1876); ‹Properties of Liquid Films› (1880–92); ‹Magnetic Surveys of the British Isles for the Epochs 1886, 1891› (2 vols., 1890–96).

**RUCKERT, Friedrich,** frēd'rĭн rük'ĕrt, German poet and Orientalist: b. Schweinfurt, Bavaria, 16 May 1788; d. Neuses, near Coburg, 31 Jan. 1866. He was educated at Heidelberg and at Würzburg. He first began to write under the pseudonym of «Freimund Raimar,» and ‹Deutsche Gedichte› appeared with that signature. From 1826 to 1841 he occupied the chair of Oriental languages in the University of Erlangen, and while there was called to Berlin as privy councillor to Frederick IV. Here he also pursued his work as a philologist and poet. He retired to private life in 1848, becoming one of the most prolific writers of his day. He had a remarkable command of language and wrote almost every known form of verse. His original poems relating to the East are ‹Morgenländische Sagen und Geschichten› (1837); ‹Rostem und Suhrab: eine Heldengeschichte› (1838); and ‹Die Weisheit des Brahmanen› (1836–39). His adaptations include ‹Die Verwandlungen des Abu Seid› of Hariri (1826); ‹Nal und Damajanti› from the ‹Mahabahrata› (1828); ‹Amrilkais› (1843); and ‹Hamasa› (1846). Among his other works are ‹Saul und David› (1843); ‹Liebesfrühling› (1844); and ‹Lieder und Sprüche› (1866). Consult biographies by Beyer (1868–77); Konrad Fischer (1889); and Reuter, F., ‹Rückert in Erlangen und Joseph Kopp› (1891).

**RUCKSTUHL,** rŭk'stool, **Fred Wellington,** American sculptor: b. Breitenbach, Alsace, 22 May 1853. At two he was brought to America by his parents who settled in Saint Louis, Mo. His art studies were begun in 1883 in Paris. His first exhibit, a life size nude figure called ‹Evening,› won honorable mention in the Salon and a Grand medal at Chicago World's Fair, and has since been in the Metropolitan Museum, New York; bronze group, ‹Mercury Amusing Himself,› Portland place, Saint Louis; bronze statue, Solon,› in the Congressional Library, Washington, D. C., and for the façade of the same library, heads of Franklin, Goethe and Macaulay; bronze, ‹Victory,› on the Soldiers and Sailors' Monument, Jamaica, L. I.; equestrian statue of: ‹Gen. John F. Hartranft,› Harrisburg, Pa.; ‹Wisdom› and ‹Force,› colossal marble statues at entrance of Appellate Court House, New York; ‹Gloria Victis,› a bronze group on Confederate monument, Baltimore; ‹Defense of the Flag,› a bronze Confederate monument at Little Rock, Ark.; ‹Phoenecia,› marble colossal statue, at the Customs House, New York City; ‹Color Bearer,› Petersburg Battlefield, Va.; equestrian statue, ‹Gen. Wade Hampton,› Columbia, S. C.; marble statue, ‹John C. Calhoun,› in the Hall of Fame, Washington, D. C.; bronze group, ‹Woman's Monument,› at Columbia, D. C.; a bronze statue, ‹Dr. Charles D. McIver,› Raleigh, N. C.; monument to the ‹Three Partisan Generals, Sumter, Moultrie and Pickens,› at Columbia, S. C.; marble statue, «U. M. Rose,» in the Hall of Fame, Washington, D. C., etc. Mr. Ruckstuhl is member of the National Institute of Arts and Letters, the National Sculpture Society, the Architectural League, etc.

**RŪDAGĪ**, roo'dạ-gē, or **RUDAKI**, **Farideddin Mohammed,** Abdāllah, Persian poet: b. Rūdag, Transoxiana, about 870–900; d. 954. He was the earliest of the great modern Persian poets and for many years lived at the court of Nasr II, ruler of Khorasañ and Transoxiana, in affluence and with high honors. He is said to have been blind from birth, but his writings show an accurate knowledge of colors. His work survives only in fragments but these are models of form, and of exquisite taste and feeling. He is known as «the Father of Persian Literature» and succeeded in emphasizing clearly the different forms of epic, lyric and didactic poetry. He is credited with originating the *diwan,* the arrangement of a poet's work in nearly alphabetical order which still maintains among Mohammedan writers. Of his epics only stray lines remain, although there are 52 of his kasīdas, ghazals and rubā'īs. His translation of an Arabic version of the old Indian fables ‹Kalilah and Dinmah› into Persian also is lost. After the death of his royal patron in 942 he fell into poverty and obscurity. A complete edition of his remaining works, in the Persian text and with a German translation, was prepared by Ethé, H., ‹Rūdagī der Samanideñdichter› in ‹Göttinger Nachricten› (pp. 663–742, 1873). Consult Pickering, C. J., ‹A Persian Chaucer› (1890); Brown, E. G., ‹Literary History of Persia› (1902).

**RUDD, Steele** (pen name), Australian literary man (see Davis, Arthur Hoey).

**RUDD, William Platt,** American lawyer: b. Albany, N. Y., 9 June 1851. He studied law at Union University, was admitted to the bar in 1875 and became a member of the law firm of Harris and Rudd. He was counsel for important corporations and in 1910 was elected justice of the Supreme Court of New York for the term ending 1924.

**RUDDER,** an instrument by which a ship is steered, being that part of the helm which consists of a piece of timber which enters the water and is attached to the sternpost by hinges, on which it turns. The action of the rudder may be thus explained: while it remains in line with the keel, the force of the water gliding past the deadwood, or narrow portion of the stern, is equal on both sides of the rudder and equilibrium is maintained; if however the rudder be forced to one side the pressure is taken off on the opposite side, while the water exercises an increased pressure on the side to which the rudder is turned. The effect is to force the stern round on the centre of gravity as a pivot, the ship's head, of course, turning to the same side as the rudder. When the head has sufficiently deviated from its former line the rudder is permitted to resume its straight position. In sailing on a wind, the rudder is kept permanently on one side to counteract the tendency to make leeway.

**RUDDER FISH,** so named from being perceived usually in the wake of ships, following the rudder, and doubtless attracted by the refuse thrown overboard, is a small fish of the genus *Palinurus* allied to the mackerel family, very common in the Pacific and Atlantic oceans. The *Palinurus perciformis,* the rudder perch, or black pilot fish of the fishermen of Martha's Vineyard, attains a length of from 9 to 12 inches and is caught on the coasts of Massachusetts and New York, specimens having been obtained in Boston Harbor hovering around the sterns of vessels or keeping near such floating bodies as casks, planks, logs and other flotsam. The back and top of the head is brownish with black blotches, the sides bluish-white with minute black dots and the under parts lighter; the color of the young is a bright bronzed black, variegated with yellow circular spots, obscure reddish hues and streaks of white and yellow lining the sides; there is a depression between the eyes which are protected by an overhanging bony ridge and in front of the fleshy rays of the dorsal are eight short spines. The rudder fish belongs to the division of the scomberoids in which the first dorsal is composed of isolated spines connected by a low membrane, but unlike the scomberoids there are one or more spines in front of the anal fin. The name rudder fish is also less specifically applied to any fish habitually following in the wake of vessels.

**RUDDER GRANGE,** one of the best known and most humerous of the novels of Frank R. Stockton. It appeared in *Scribner's Monthly* in 1874; and was followed by the 'Girl at Rudder Grange' in 1875 and the 'New Rudder Grange,' 'Camping out at Rudder Grange' and 'Pomona Takes the Helm at Rudder Grange' in 1878; and 'Pomona's Bridal Trip' in 1879; in which latter year the story first appeared in book form. Previous to this Stockton had made a reputation as a writer of stories for children, but 'Rudder Grange' was his first book for adult readers. In the Stockton household was «a middle-sized orphan» from an orphans' home, a very peculiar, sentimental, strong-willed girl of 14, in whom Stockton took a very decided and peculiar interest; for she appealed strongly to his sense of humor and upon whom he bestowed the name of Pomona. The result of his study of her was a paper in *Scribner's Monthly,* entitled 'Rudder Grange,' which attracted wide attention and Stockton was induced to continue the idea, the history of the little girl being carried into womanhood. 'Rudder Grange' brought Stockton seriously before the public as a humorous writer of stories other than children's tales. So popular was this series that Stockton was induced to follow it up with 'Rudder Grangers Abroad' and 'Pomona's Travels.' 'Rudder Grange' is a book without a plot; and it gets along well without. It deals with eccentric and humorous doings and sayings, for the most part of Pomona, from the time she enters the Grange until she finally marries and has a home and a family of her own. The 20 papers of which the book is made up develop her character by taking her through a series of adventures and ridiculous situations in which the humor is ever on the surface. But an outline of the story would be the story itself.

**RUDDIMAN,** rŭd'ĭ-man, **Thomas,** Scottish scholar: b. Raggel, Banffshire, October 1674; d. Edinburgh, 19 Jan. 1757. He was graduated at Aberdeen in 1694, revised and edited several works by Scottish authors and to the famous poetical translation of Virgil's 'Æneid,' by Bishop Douglas, added a glossary, which brought him fame as a Latin scholar. In 1714 he published his 'Rudiments of the Latin Tongue,' a work which supplanted all previous Latin grammars in use in Scotland and which he lived to see pass through 15 editions. In 1715 he became a publisher and in this capacity edited and brought out many famous books and in 1725 the first volume of his own 'Grammaticæ Latinæ institutiones,' and an abridgment of the three volumes in 1740. Consult Chalmers, 'Life of Ruddiman' (1794); Chambers, 'Eminent Scotsmen.'

**RUDDY DUCK,** a rather small, quick-diving handsome duck (*Erismatura rubida*), found throughout North and Central America, and breeding in all suitable localities. It is related to several foreign sea-ducks, the Australian musk-duck, etc., but is itself confined to this continent. This duck is about 17 inches long and chiefly tawny brown, the drake becoming glossy chestnut in full breeding plumage; considerably waved and dotted and the lower parts mottled silver-white.

**RUDE, François,** frän-swä rüd, French sculptor: b. Dijon, 4 Jan. 1784; d. Paris, 3 Nov. 1855. He was originally a blacksmith, but entered the École des Beaux Arts in 1807 and was under the instruction of Cartellier. From 1815 to 1827 he worked at Brussels decorating the royal palace and subsequently settled at Paris, where his real artistic life began. His chief works, which show a combination of antique simplicity with modern naturalism, are his 'Mercury' (1827), now in the Louvre; his 'Neapolitan Fisher Boy,' also in the Louvre; his 'Louis XIII,' as a boy 1842; 'Sepulchral Monument of Cavaignac,' in the cemetery of Montmartre (1847); a 'Crucifixion' and the 'Maid of Orleans' (1852), both in the Louvre; 'Hebe' and 'Love as the Conqueror of the World,' in the museum of Dijon.

**RUDEL, Jaufré,** zhō'frā roo'dĕl, a famous troubadour poet: b. Blaye (Gironde) in the 12th century; d. Tripoli. A soldier and a wanderer, he became celebrated for his love affairs, which he idealized in his poems. He was of noble birth and Lord of Blaye; and in his youth he joined the court of William of Agoult, Lord of Sault. He afterward lived at the Court Geoffroi, Count Bretagne, son of Henry II of England, where he was a favorite and honored as one of the greatest of troubadours. While with this prince, he fell in love with a certain Countess of Tripoli, by report of her brought to the court by pilgrims from Antioch. So impressed was he with the story of her charms and graces that he refused to sing of any other lady. In spite of the opposition of the count, he disguised himself as a pilgrim and set out to visit the Countess of Tripoli. On the way he became very ill and in this condition he arrived at Tripoli. Word was sent to the Countess and she had the poet brought to her palace, where he had scarcely arrived when he died in the presence of her ladyship, who had him buried in the royal tomb of Tripoli; and she had his poems written in a book with letters of gold. These poems of Rudel are among the most tender in the Provençal literature (q.v.). Rudel's tale has been dramatized by Edmond Rostand in the ‹Princess Lointaine.›

**RUDERAL PLANTS** (Lat. *rudus,* rubbish), plants growing in waste places, amid rubbish and by the wayside. There is usually rapid change in such areas, the profusely-seeded and rapid-growing annuals first securing a foothold and covering the waste space; but these are soon crowded out by the hardy perennials, among which grass is largely predominant. Naturalized plants often gain a temporarily strong foothold in such places because of less severe competition and the absence of natural enemy species, but gradually are reduced in numbers to the natural struggle between native plants.

**RUDINI,** roo-dē'nē, **Antonio Starabba di,** Marquis, Italian statesman: b. Palermo, Sicily, 6 April 1839; d. 7 Aug 1908. In 1866 he became mayor of Palermo and in 1867 a member of the Chamber of Deputies. He was appointed Minister of the Interior in the following year. After the fall of the Menabra Cabinet he held no prominent office until 1891, when, having become the head of the Constitutional party, he succeeded Signor Crispi in the Ministry of Foreign Affairs and was made Premier. In 1892 the premiership passed again to Crispi, but in 1896 Rudini returned to power as a result of Signor Crispi's disastrous Abyssinian policy. He continued in the premiership until 1898, when he resigned his office. His renewal of the Triple Alliance and conclusion of peace with Abyssinia were the most important of his executive acts, while his continued yielding to the pressure of the Radical party and failure to weld the Conservative elements of the Italian Parliament are quoted against his administration.

**RUDOLF OF EMS,** mediæval German poet or minnesinger: b. Switzerland; d. Italy, about 1251–54. He began to write about 1225. He wrote many legendary, historic and dramatic poems; and also a version of the Old Testament down to the time of Solomon, ‹Weltchronik,› which was dedicated to his patron Conrad IV, and which was widely read as it was for long the only available popular presentation of early Biblical events. He was besides author of the poems ‹Der Gute Gerhard›; ‹Barlaam und Josaphat›; ‹Wilhelm von Orleans›; ‹Alexander.› etc.

**RUDOLF LAKE** (known also as Basso Norok and Gallop), a large lake of eastern equatorial Africa, at the south of the Abyssinian highlands and occupying a portion of the great equatorial plain. It is 225 miles northeast of Victoria Nyanza; and is about 185 miles in length and 37 at its greatest width, its area being about 3,500 square miles. It is deep at the southern end, but shallow at the northern, where it is fed by the Omo or Nianani River. Having no outlet its water is brackish but not harmful for drinking purposes. The surrounding region is sterile, with high cliffs at the south and lava fields or sandy wastes at the northern end. It was discovered by Teleki and Von Höhnel in 1888. In 1907 an agreement was reached between Great Britain and Abyssinia, whereby the northern end was ceded to Abyssinia, the remainder falling to Great Britain.

**RUDOLF I,** roo'dŏlf, emperor of Germany, founder of the Imperial house of Austria: b. 1 May 1218; d. Germersheim, 15 July 1291. He was the eldest son of Albert IV, Count of Hapsburg and Landgrave of Alsace, was brought up in the court and camp of the Emperor Frederick II and on the death of his father succeeded to lands of very moderate extent, which, in the spirit of the times, he sought to augment by military enterprises. He gained some territory by his marriage in 1245 and more by his frequent military aggressions. In 1273, while encamped before the walls of Basel, he received the unexpected intelligence that he was elected king and Holy Roman emperor, in preference to Alphonso, king of Castile, and Ottokar, king of Bohemia. His confirmation was not attained without some difficulty, however. Pope Gregory X induced the king of Castile to withraw his pretensions, but the king of Bohemia, at that time one of the powerful princes in Europe, persisted in his opposition, and a war ensued, in which the latter was defeated, compelled to sue for peace and to agree to pay homage. He broke the treaty in 1277, but the following year was defeated a second time and slain. The Diet of Augsburg in 1282 formally conferred Austria, Styria, Carinthia and Carinola on Rudolf's two sons, Albrecht and Rudolf, as a joint inheritance. He restored peace and order to Germany, and wisely put down the private fortresses, which served as a retreat for banditti and ferocious nobles. For these and other eminent services in the same spirit he obtained the title of «a living law,» and was regarded as a second founder of the German Empire. He asked the Diet at Frankfort to secure the imperial throne to his son Albrecht, but the electors were jealous of the powerful family and their refusal caused such mortification to the aged emperor that he did not long survive. Consult Kopp, ‹König Rudolf und seine Zeit› (1845–49, continued by Busson 1871); Hein, ‹Rudolf von Habsburg› (1874); Schulte, ‹Geschichte der Habsburger› (1887); Zisterer, ‹Gregory X und Rudolf von Habsburg› (1891).

**RUDOLF II,** Holy Roman emperor: b. Vienna, 18 July 1552; d. Prague, 20 Jan. 1612. He was educated in Spain, and before the death of his father, Maximilian II, was crowned king of Hungary in 1572, king of Bohemia in 1575, the same year being also crowned at Ratisbon as Roman emperor. He succeeded to the Austrian throne, 12 Oct. 1576. His disposition was mild and his tastes inclined toward literature rather than toward government. Early in his reign he began to impose restrictions upon the holding of public offices by Protestants and in some districts civil war resulted. The western parts of the empire were enabled to overcome the designs of the king, and by 1603 the

Protestants formed an offensive and defensive alliance at Heidelberg to maintain their civil and religious liberties. In Austria, Bohemia and Hungary, however, the Protestant religion was for a time practically suppressed. The Turks made constant inroads in the east and in 1596 Mahomet invaded Hungary, captured Erlau and defeated the Austrians under Archduke Maximilian, though he ceased his incursions at this point. In 1608 Rudolf's brother Matthias, who had made a treaty with the Turks and pacified the disaffected Hungarians, compelled Rudolf to acknowledge him king of Hungary and governor of Austria and Moravia. With this confirmation of Matthias' power the states of Austria regained the religious privileges they had enjoyed under Maximilian. In 1611 Rudolf was formally deposed and Matthias succeeded him. Rudolf was the patron of Kepler and Tycho Brahé and the astronomical calculations produced by these two are known as the «Rudolphine Tables.» Consult Gendely, ‹Rudolph II und seine Zeit› (1863–65).

**RUDOLPH, Franz Karl Joseph,** Archduke and Crown Prince of Austria, son of Francis Joseph I: b. 21 Aug. 1858; committed suicide, Mayerling, near Vienna, 30 Jan. 1889. He entered the army in 1877 and saw some active service. He was a gifted linguist; traveled considerably and was a writer of ability. He collaborated on ‹Die Österreichisch-Ungarische Monarchie in Wort und Bild› (1886), and was author of ‹Funfzehn Tage auf der Donau› (1881); ‹Eine Orientreise› (1884).

**RUE,** a perennial plant (*Ruta graveolens*), wild in the Mediterranean region, but also cultivated. Its stems are about two feet high, bearing alternate decompound bluish green leaves, pellucid-dotted, with an acrid juice and bitter taste; and corymbs of yellowish green, small, four-parted flowers, with crimped petals. Rue has been employed medicinally on account of its antispasmodic and stimulant properties, and was also used in folk medicine as a disinfectant, probably because of its strong and disagreeable odor and taste, which, however, did not prevent its use as salad. Rue also entered largely into magic rites and witch-lore. Early missionaries in England were said to have sprinkled water from brushes made of rue, whence the name referred to by Ophelia: «There's rue for you . . . We may call it, herb of grace o' Sundays,» and Perdita speaks of it, with rosemary, as one of the flowers for remembrance.

**RUEDA,** roo-ā'dạ, **Lope de,** Spanish actor and dramatist: b. Seville, in the early part of the 16th century; d. before 1567. He was a gold-beater by trade; but became one of the most successful actors of his day. He is credited with being the first to write popular Spanish drama and to have been, therefore, the leader in the movement that was destined shortly after his day to produce Lope de Vega, Calderon and the other great dramatists of the golden age of Spanish drama. He became the head of a strolling company of players who seem to have wandered over a considerable part of Spain and to have acted plays written by Rueda with a view to suiting the public taste. Therefore, Rueda is credited with having made of the theatre and the profane drama a popular institution. He was also credited in his day with being an excellent dramatist and a good poet; among his admirers being Lope de Vega and Cervantes. It was not until after his death that his works appeared in print. They were collected and published by his friend Juan de Timoneda from time to time between 1567 and 1588. This collection consists of 10 pasos, or dramatic interludes based upon some simple episode; two dialogues (in verse); four comedias and two pastoral colliques, all, with the exception noticed, in prose; and all bearing the earmarks of having been written for presentation upon the stage, evidently by his own company. The comedias are divided into scenes, but not into acts. These are entitled ‹Los Engaños›; ‹Medora›; ‹Eufemia› and ‹Armelina,› the last of which is decidedly the best from both the dramatic and the literary points of view, but it employs mythological characters in a weird and startling manner, which nevertheless display the author's originality and boldness. His manner in the comedias, as in all his work, is light and quite natural even when he deals with supernatural characters. His comic parts are also well presented and in fact the comedy is the only really good part of his two pastoral colloquies, the better of which is ‹Timbria.› The two dialogues ‹Prendas de Amor› and ‹Diálago sobre la invención de las calzas,› together with some songs, constitute practically all of Rueda's poetry that has come down to us. In all his dramas and other works Rueda shows an appreciation of the chief factors in the entertainment of the theatre-going public. In fact the audience seems to be ever in his mind. This is undoubtedly why both Cervantes and Lope de Vega credited him with being the father of popular national drama in Spain. His greatest move in the right direction for the creation of a national drama was his selection of his personages, subjects and scenes from the common life around him. This permitted him to be at once natural and familiar without danger of losing the interest or respect of his audience. In other words, he realized the dramatic element in life and its compelling interest as no Spanish dramatist previous to his day had done; and he set the fashion for representing life in a more or less realistic manner for the great national dramatists who followed him and, to a certain extent, imitated him. Among the editions of his works are two of note, in addition to that by Timoneda, that by the Marquis de la Fuensanta del Valle (Madrid 1895–96), and that by Emil Cotarelo y Mori (Madrid 1908). Consult Cotarelo v Mori, E., ‹Estudios de historia literaria de España› (Vol. I, Madrid 1901); Fitzmaurice-Kelly, ‹A History of Spanish Literature› (New York 1908); Salazar, S., ‹Lope de Rueda y su teatro› (Santiago de Cuba 1911), and Ticknor, ‹History of Spanish Literature› (New York 1854).

**RUEF,** roof, **Abraham,** American political boss: b. San Francisco, Cal. He was graduated at the University of California in 1884 and was admitted to the bar in 1886. He made himself a political power in San Francisco, and was said to control the city administration through Mayor Eugene F. Schmitz, elected in 1901. There were graft scandals implicating Ruef, as an attorney, together with the mayor and board of supervisors in the division of the spoils. Ruef was brought to trial through the efforts of San Francisco citizens, headed by Rudolph Spreckels. The services of Francis J. Heney, who had acted for the United States in the Oregon land scandals, and William J. Burns of the United States secret service, were secured and Ruef was in 1911 convicted of bribery and sentenced to nine years, imprisonment. He was paroled in 1915 on a pledge to remain out of politics.

**RUELLIA** (Neo Lat. named for Jean Ruel, a French botanist of the 16th century), a genus of herbs and shrubs of the family *Scanthaceæ.* The genus is characterized by opposite leaves, and bears flowers of large size in shades of violet, white and red, and occasionally yellow or orange. There are about 200 species, chiefly native to tropical America, while occasional varieties are found in Asia, Africa and Australia; and some eight varieties are found in the United States. About 20 varieties are under cultivation, some of them being especially desirable for greenhouse use. *R. tuberosa* is the «manyroot,» also called «spirit-leaf» and «snapdragon»; *R. paniculata* is a trailing variety found in Mexico and Jamaica and has inch-long blue corollas; *R. ciliosa* is a charming hardy species of southern United States; *R. indigotica* furnishes by maceration an indigo-like dye and is native to India, Burma and China.

**RUFF,** a sandpiper (*Machetes pugnax*) of the northern parts of the Old World, the female of which is called «reeve.» It is about 10 inches long and the bill 1¼; above it is varied with black, rufous and gray, arranged in oblique bands on the scapulars and tertiaries and whitish below; primaries dark brown, with green reflections above and with inner webs finely mottled toward the base; the tail transversely barred; sides of rump white, bill brown and legs yellow. The males in spring have the feathers of the neck developed into a kind of ruff, whence the common name, and the face is covered with reddish papillæ. They fight during the breeding season, unlike most wading birds; they are also polygamous and larger than the females, in these respects seeming to form one of the links between wading and gallinaceous birds. The colors of the ruff vary exceedingly and no two are precisely similar. They are natives of northern Europe and Asia, migrating southward during winter, and they are found chiefly in flocks, in marshy districts; they feed at night on worms, insects and larvæ; the nest is made of coarse grass and is placed in a hollow of the ground; the eggs are four or five, pointed, green, with brown specks. Their flesh is highly esteemed for the table; they are taken alive in nets and are fattened for market on bread and milk and boiled wheat, in a dark place to prevent their fighting; great numbers are sent from Holland to London.

**RUFFED GROUSE.** See GROUSE.

**RUFFED LEMUR.** See LEMURS.

**RUFFIN, Edmund,** American agriculturist: b. Prince George County, Va., 5 Jan. 1794; d. near Danville, Va., 15 June 1865. He was educated at William and Mary College, served in the Virginia legislature, was for many years president of the Virginia Agricultural Society, and in 1833–42 editor of the *Farmer's Register.* He was an ardent State's rights man and as member of the Palmetto Guard of South Carolina fired the first shot on Fort Sumter in 1861. He committed suicide because of his unwillingness to give allegiance to the United States government. He published ‹Essay on Agricultural Education› (1833); ‹Anticipations of the Future to Serve as Lessons for the Present Time› (1860); edited William Byrd's ‹Westover Manuscripts› (1841), etc.

**RUFFO,** roof′fō, **Fabrizio,** Italian cardinal: b. San Lucido, Calabria, 16 Sept. 1744; d. 13 Dec. 1827. He came of a ducal family and was educated as a priest, but never took orders. He gained the favor of Pius VI, who had him appointed treasurer-general and made him a cardinal in 1791. He headed the royalist movement in Calabria, his family connection greatly aiding him, and in 1799 he became vicar-general. With Fra Diavolo, the brigand chief, he raised an army and succeeded in overturning the Republican government and expelling the French, restoring Ferdinand I to the throne. He took no part in public affairs during the second French invasion, but after the restoration of the Bourbons was in favor at court and for a short period in 1822 was a royal minister. Consult Sacchinelli, D., ‹Memorie Storiche Sulla vita del Cardinale Fabrizio Ruffo› (1836); Von Helfert, ‹Fabrizio Ruffo: Revolution und Gegan — Revolution von Neapel› (1882).

**RUFINUS,** roo-fī′nŭs, **Tyrannius,** Latin ecclesiastical writer and presbyter: b. Aquileia, Venetia, about 345; d. Sicily, 410. He was converted to Christianity about 370, became a close friend of Jerome and in 379 after extended study and wandering founded a monastery at the Mount of Olives, Palestine. He was made presbyter by Bishop John of Jerusalem about 394; and took the bishop's side in the controversy with Epiphanius of Salamis over the doctrines of Origen, which action ended Rufinus' friendship with Jerome. He returned to Rome in 397 and there enjoyed the protection of Bishop Siricius, but was summoned by Anastasius, the succeeding bishop, to defend his orthodoxy and was formally condemned. He was on his way to Palestine when he died. Through his writings and translations he exerted a profound influence over the Western Church, as he not only made available the writings of the Greeks, but by his translation preserved several valuable works which otherwise would be lost. He made a rather free translation of the ‹Church History› of Eusebius and brought the history down to the reign of Theodosius the Great. He also translated several exegetical works of Origen; the ‹Peri Archon›; the ‹Apology of Pamphilus›; the ‹Homilies› of Basil›; ‹Canon Paschalis of Anatolius Alexandrinus›; and many other works. He was author of ‹Apologia pro fide sua›; ‹De adulteratione Liborum Origenis›; ‹Historia Eremitica›; ‹Expositio Symboli.› etc.

**RUGBY,** England, a market town of Warwickshire, 81 miles by rail northwest of London. It is picturesquely situated on an eminence south of the Avon and is celebrated for its public school. (See RUGBY SCHOOL). The parish church recently restored, the modern municipal offices and the free public library are other noteworthy features.

**RUGBY,** Tenn., the place in Morgan County, about 140 miles north of Chattanooga, where Thomas Hughes (q.v.) and others from England established a colony in 1880. They purchased a large tract of land, laid out a town, divided the remaining portion into farms and parks and established several industries. It is in a rich mining and agricultural region on the Cumberland plateau. The settlement proved a failure; but the place is now a health resort.

**RUGBY SCHOOL,** a famous English public school founded in 1567 by Lawrence Sheriff, who bequeathed for its support property in Manchester square, London. Until the second quarter of the 19th century its importance was local in character, however, but under the headmastership of Arnold (q.v.) 1828–42, it became one of the greatest schools of England,— to be ranked with Westminster, Eton and Harrow. Among famous headmasters who followed Arnold are Archbishop Tait, the late Dean Bradley of Westminster, the late Archbishop Temple and John Percival, bishop of Hereford. The roll of distinguished Rugby scholars is a long one; among them may be mentioned Matthew Arnold, Dean Stanley, Landor, Clough, Thomas Hughes, author of ‹Tom Brown's School Days,› Dean Vaughan and Lord Derby. Under the mastership of Dr. Temple (1857–69) the chapel was rebuilt, a gymnasium erected and other new buildings added, while under Dr. Jex-Blake (1874–87) still more building was carried on and Rugby is to-day particularly modern in the character of its edifices, which are Elizabethan in style and in appointments generally. Consult Goulburn, ‹The Book of Rugby School› (1856); Hughes, ‹Tom Brown's School Days› (1857); ‹Life of Thomas Arnold› (1860); Bloxam and Payne-Smith, ‹Rugby: its School and Neighborhood› (1889); Rouse, ‹History of Rugby School› (1898).

**RUGE,** roo'gĕ, **Arnold,** German Socialist: b. Bergen, Prussia, 13 Sept. 1802; d. Brighton, England, 31 Dec. 1880. He was educated at Heidelberg, Jena and the University of Halle, where in 1830 he became a professor. His first literary production was a translation of Sophocles' ‹Œdipus in Kolonos› (1830). He was later identified with the founding of the ‹Hallesche Jahrbücher› and became known as an advocate of radical doctrines. In 1843 he went to Paris where he was associated with Karl Marx and there published his ‹Zwei Jahre in Paris.› In 1847 he started a journal, *Die Reform,* in Berlin. Accused of complicity in the Revolution of 1848, he fled to England. He was there identified with Mazzini and Ledru-Rollin in their efforts to organize a democratic league for the establishment of political equality throughout the world. The movement to unite the provinces of Germany in 1866–70 was strengthened by his sympathy and his services in this cause were recognized by the German Empire. He published ‹Political Pictures› (1848); ‹Our System› (1850); ‹In Former Times› (1862–67); and a ‹Manifesto of the German People› (1866).

**RÜGEN,** rü'gĕn, an island belonging to Germany, in the Baltic Sea, area, 377 square miles. The coast has many indentations; on the northeast the island terminates in a chalk cliff, nearly perpendicular and about 400 feet above the water. Peculiarly shaped boulders are found on different parts of the island. According to Tacitus, the ancient Germanic goddess Hertha (Earth) was worshipped here at Hertha Lake. The soil is fertile; agriculture, stockraising and fishing are the chief occupations. The coast villages are popular sea-bathing resorts. Bergen is the capital. Pop. 46,800.

**RUGENDAS,** roo'gĕn-däs, **Georg Philipp,** German painter: b. Augsburg, 1666; d. there, 1742. His right hand becoming disabled he painted and engraved with his left. He exposed himself to the fire and carnage at Augsburg that he might delineate the scene.

**RUGER,** roo'gėr, **Thomas Howard,** American army officer: b. Lima, N. Y., 2 April 1833; d. Stamford, Conn., 3 June 1907. He was graduated from West Point in 1854, studied law and in 1855–61 was engaged in practice. At the outbreak of the Civil War he was appointed lieutenant-colonel and was prominent in numerous engagements. He suppressed the draft riots in New York in 1863, was in command of a division at Gettysburg, served under General Sherman and in 1864 was brevetted major-general of volunteers. He was mustered out of the volunteer service in 1866, and in that year was appointed colonel in the regular army. In 1868 he was military governor of Georgia, superintendent at West Point in 1871–76 and in 1876–78 was in command of the Department of the South. He was promoted major-general in 1895 and in 1897 was retired.

**RUGGLES,** rŭg'lz, **Samuel Bulkley,** American lawyer: b. New Milford, Conn., 11 April 1800; d. Fire Island, N. Y., 28 Aug. 1881. He was graduated at Yale in 1814 and was admitted to the bar of New York in 1821. He was elected to the State legislature in 1838 and secured the enlargement of the Erie Canal through borrowed funds instead of waiting for the money to be collected by tolls. He was president of the board of commissioners for the canal in 1840–42 and in 1858, and was United States delegate to the International Monetary Conference held at Paris in 1867. He laid out Gramercy Park, New York, in 1831 and presented it to the surrounding property-owners to be maintained as a private park, and was also connected with the planning of Union square. He was author of many papers concerning the Erie Canal, and on legal and financial topics.

**RUGGLES, Timothy,** American lawyer, politician and loyalist: b. Rochester, Mass., 20 Oct. 1711; d. Wilmot, Nova Scotia, 4 Aug. 1795. He was graduated from Harvard in 1732, represented Rochester in the General Court in 1736, opened a law office at Sandwich, Barnstable County, and was connected with many cases of local importance in Plymouth, Bristol and Barnstable counties. Subsequently he removed to Hardwick. In 1755 he was second in command to Sir William Johnson at the battle of Lake George, in 1756, was made judge of the Court of Common Pleas of Worcester County, and represented Hardwick in the General Court. In 1762–63 he was speaker of the house, and from 1762 until the Revolution chief justice of the Court of Common Pleas in Worcester County. He served with distinction in 1759–60 in the expeditions against Quebec and Montreal, and in recognition received the sinecure post of surveyor-general of the king's forests. He was a delegate in 1765 to the Stamp Act congress at New York and was elected its president. Upon his refusal to forward to Great Britain the addresses and petitions passed by the congress, he was reprimanded by the General Court. From that time he was identified with the royalist cause. In 1774 he was made mandamus councillor, and in consequence was forced for safety to flee from Hardwick to Boston, then garrisoned by the British. He made some efforts to recruit a loyalist corps, and in 1779, on the departure of the British troops, went with them to Nova Scotia, where he became a proprietor of the town of Digby. He was a scholar and wit and an excellent, though aggressive, pleader. Consult Washburn, Emory, 'Sketches of the Judicial History of Massachusetts from 1630 to the Revolution in 1775' (Boston 1840).

**RUGS, Oriental. History.**—The origin of the floor coverings, popularly known as Oriental rugs, is a matter of tradition and, therefore, purely suppositional, for the fragmentary record of the ancients, on this subject, is casual and exceedingly incomplete.

Undoubtedly, however, along with the slow evolution of human progress, rugs, in some form, filled their proper places in the scant household furniture of primitive man.

An old Hebraic tradition ascribes distinction of skilful spinning of wool and weaving of cloth to Naamah, daughter of Lamech, who was a near descendant of Adam, thus placing the handicraft of weaving close to the Biblical account of the beginning of the human race.

It is not at all improbable that Egypt, the successful producer of many useful industries of the ancients, improved the crude handiwork of her predecessors, for we possess records of rugs on her rock-cut tombs, carvings and monuments, some of which date as early as 27 centuries B.C.

Other wall paintings, stone carvings and monuments in the Euphrates Valley indicate clearly that the dwellers of these regions, such as Chaldeans, Assyrians, Armenians and Persians were the first to use the rug for floor coverings, wall hangings, tomb coverings, awnings and for devotional purposes, and that afterward the conquerors of these peoples, the Greeks, Romans, Turks, Turkomans and Saracens took up the industry and spread its popularity throughout their dominions.

**Ancient Authorities.**— Besides Biblical writers, among the ancients who mention rugs and carpets are included Diodorus, Ebers, Homer, Plautus, Horace, Pliny, Josephus, Arrian and almost all writers of note; but as stated above, not one of these famous men imparts definite information concerning the industry.

**Introduced into Europe.**—While very little is known concerning the rugs of the ancients, our knowledge takes definite shape and grows in volume along with the triumphant march of the religion of Mohammed the great prophet of Arabia, whose enthusiastic followers went from victory to victory till they threatened the very existence of mediæval Europe.

Rug making was introduced to Europe by the Moors, whose palaces and mosques in Cordova, Granada and Castile were adorned with magnificent carpets, and later, when the Crusaders returned from their wars against the followers of the Crescent, they brought back with them not only a powerful desire for Oriental luxuries, but a knowledge of Oriental handicrafts, most important among which were rug and carpet making.

Thus, in about the latter part of the 13th century A.D. rugs were introduced in Europe as objects of wonderful ingenuity and of great value.

From that time interest in rugs from the Orient has constantly increased among all civilized peoples till to-day they rule supreme as the most desirable and most artistic floor coverings in the world.

**Process of Making.**— The general process of rug making of to-day is as old as when it was described first by ancient writers. To-day rugs are made by the descendants of the first rug makers in the same crude and primitive fashion. Nothing has been changed — nothing could be changed — for the process is so absurdly rudimentary that it precludes improvement. In the use of material, dyes and implements there has been no alteration made since before the period when Cleopatra was presented to Cæsar wrapped in a magnificent carpet.

(a) *The Loom,* more properly the frame, on which a rug is to be made, consists of two perpendicular poles (not infrequently two trees) driven in the ground at a desired distance from each other; to these are fastened two horizontal bars, one on top, the other at the bottom of the poles.

(b) *Tools.*— It is an absurdity to dignify by the name of «tools» a crude wooden or iron comb and a pair of common shears, which about conclude the description of the «machinery» of rug making; no other implement is required for the production of the finest Oriental rug.

(c) *The Warp.*— The warp of a rug consists of a desired thickness of thread or twine of wool, cotton, linen, hemp, goats' or camels' hair, and in some cases silk, which is stretched, back and front, upon the horizontal bars of the frame, at even spaces, to form the foundation of the rug.

(d) *The Weft.*— Before actual tying of the colored yarn to the warp, the maker weaves the salvage of a diaper, beginning at the bottom of the warp. To do this he introduces a shoot of hemp or wool or cotton by means of a treadle and crossing the warp, which is repeated until a desired width is woven; then he beats this down with his comb. This cross warp, introduced after each row of the knotted yarn, is called the weft of the rug, which very often determines the fineness and the strength of the finished article.

(e) *The Knotting.*—All Oriental rugs are actually tied to the warp — tuft by tuft separately — these are tied by hand; so, properly speaking, rugs are not woven, but built, tied, knotted. This part of the process requires great skill, accuracy and more than Job-like patience.

Two ways of knotting are employed throughout the Orient in rug making: (1) The Persian (Sehna) knotting; (2) the Turkish (Ghiordéz) knotting. The Persian knotting consists in winding the two ends of the yarn around two separate threads of the warp, and bringing the two ends of the yarn to the surface from between each space of the warp. The Turkish knotting consists in winding the two ends of the yarn around two separate threads of the warp alternately and bringing the two ends to the surface between every two threads.

**The Yarn.**— Almost every wooly animal and hairy beast contributes its quota to the floor covering of the Orient, and cotton, hemp and linen, in some cases silk, and even gold and silver threads are used to bind together the «flowing lines of beauty» of the rug.

In the inaccessible fastness of Kirman, the vast mountain chains of Kurdistan and in the enchanting valleys of Shiraz and Kashmere and Euphrates, countless flocks of sheep yield the finest wool, not to mention the soft and downy wool raised in the shadow of Ararat in Armenia, and under the shelter of Demavend in Persia; and the camel of Arabia and the goat of Angora and of Bokhara vie with each other in their contribution of marvelous hair, which is transformed into bits of scintillating gems in the hands of the skilful artist of the Orient.

The wool, after being sheared, is washed thoroughly and sorted and carded upon crude wooden or iron rakes and afterward spun very much after Mr. James Bryce's description: «Each, (spinner) like the fates of Catullus, bore a distaff in her hand, with a lump of wool upon her wrist, and this they plied as they drove their flocks before them.» And, when thus the wool is spun, it is made into skeins ready for the dyer's vat.

**The Dyes.**— To dye the yarn is a separate industry in the Orient, and the skilful dyer holds equal rank with the «dervish» and the conjurer — for, to extract beautiful dyes from animals, insects, trees, plants, roots, herbs, seeds, barks, flowers, berries, fruit and from every imaginable thing yielding color is no less wonderful than the feats of a howling «dervish» or the mysterious exorcism of the magician's wand.

From the old Tyrian purple, which adorned the royal vestments of the ancients, and which is a lost dye to-day, to the ordinary red madder of Asia Minor the extracting of dyes and coloring the yarn is a long-drawn process in an exceedingly primitive manner.

The usual method is to boil in water the ingredients of a given color, with their mordant of vinegar or some other acid, in an earthen pot, till the desired consistency is reached, every little while the dyer smelling and testing the liquid. Afterward the yarn in skeins is dipped in this preparation until the required shade is obtained, then withdrawn and dried in the sun. Often the dyed yarn is exposed to the influence of the elements for weeks and weeks, till in the laboratory of nature the dye becomes a permanent portion of the wool, and remains thus as long as the material exists.

There are some dyes which require no such treatment, others which must be produced in an entirely different manner, but in each case the skilled dyer knows just how to obtain best results, and left to his own resources, given his own time, he usually accomplishes the desired end.

**Ornamentation.**— Taking a wide survey, from the Sea of Marmora at the west to the Yellow Sea at the east, Oriental rugs may be divided into two general classes, according to ornamentation: (a) geometrical; (b) floral. The development of geometrical ornamentation is attributed to the Turanian races occupying the northeastern portions of Asia, most of whose rugs bear the stamp of a more primitive type, which lead us to believe that they are more closely related to the rugs of prehistoric times. The design, popularly known as the Swastika or filfot cross, is believed to constitute the basic pattern of all geometrical ornamentation in rugs — indeed, some authorities go further in the assertion that the Swastika was the first design used for ornamentation by the human race.

The floral ornamentation, a later and more intricate method, was adopted by the Aryan races, and carried to its highest development by people inhabiting the country lying between the Caspian Sea and the Persian Gulf.

The typical design of floral ornamentation is the «flower and knob,» a conventionalized resemblance to the Egyptian lotus or the tree of life of the ancients.

An endless variety of patterns of both classes appear on rugs; they are mixed and intermingled so hopelessly that a rigid classification according to ornamentation is almost impossible.

Purely floral patterns, such as representations of leaves, trees, blossoms, rosettes, palmettes, are strewn over or under squares, circles, stars, octagons, medallions and various forms of the Swastika in a manner so blended, that a classification of rugs according to ornamentation resolves itself into an unsolvable riddle.

**Symbolism.**— It is stated by enthusiastic writers on Oriental rugs that a fascinating array of symbolism lies beyond those charming patterns.

The rug itself typifies the universe, and its various designs the ever-changing phenomena of life. The principal coloring of the field of the rug, if red, signifies life, victory; if blue, royalty; if white, purity; if green, devotion; if black, evil; if yellow, nobility; and so on to the end.

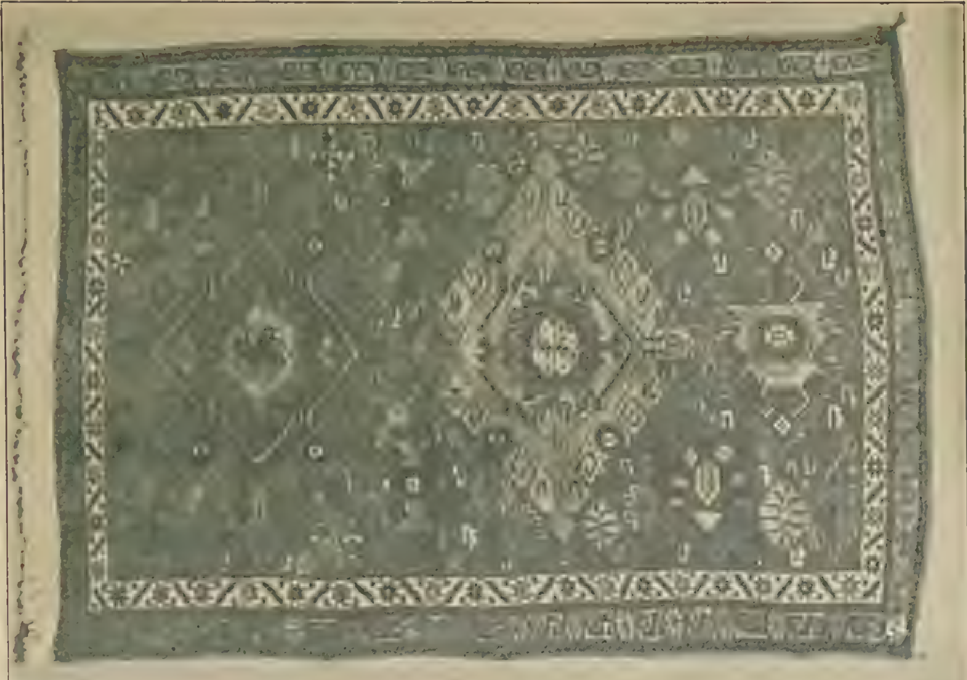
In patterns, the Swastika signifies auspiciousness, good luck; the flower and knob, fortune, life everlasting; the circle, immortality; the star, the Star of Bethlehem; the triangle, the charm of Solomon; the square, «the square deal»; the comb, cleanliness, etc.

Among vegetation, the rose typifies love; the lily, purity; the scarlet tulip of Babylon, passion; the blossom, innocence; the fruit, fecundity; the tree, abundance, etc.

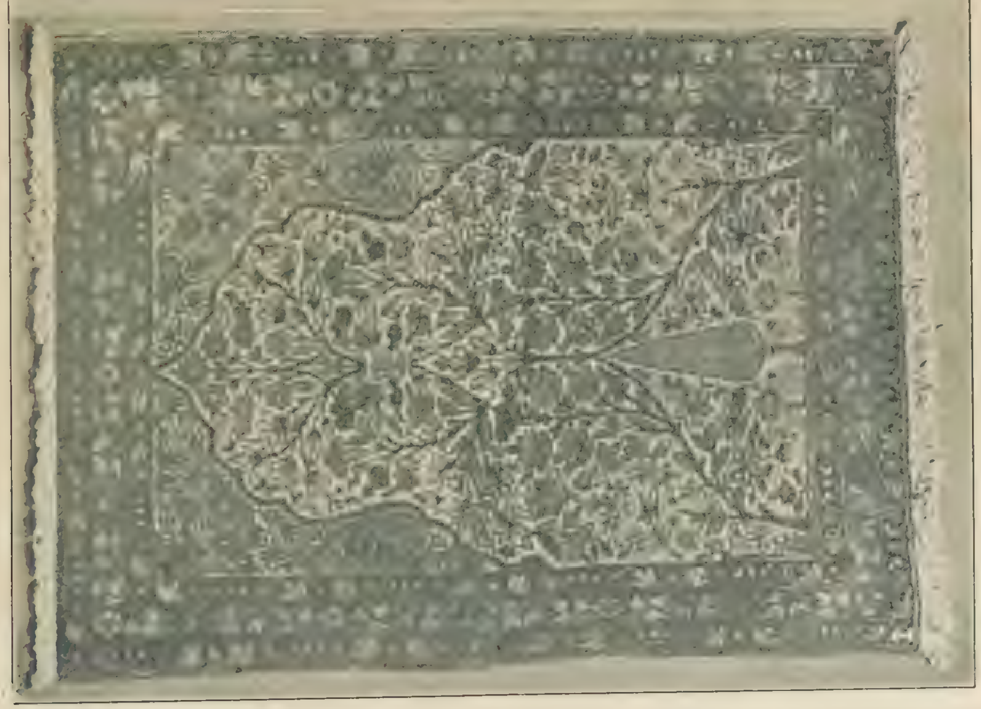
And the star of six points represents Allah!

It is reasonable to ask, however, that this endless chain of designs having come to us from the mythological past where the light of knowledge fades in the mist of tradition, who can say positively that a certain design typifies a certain idea — and is not «one man's guess as good as another»?

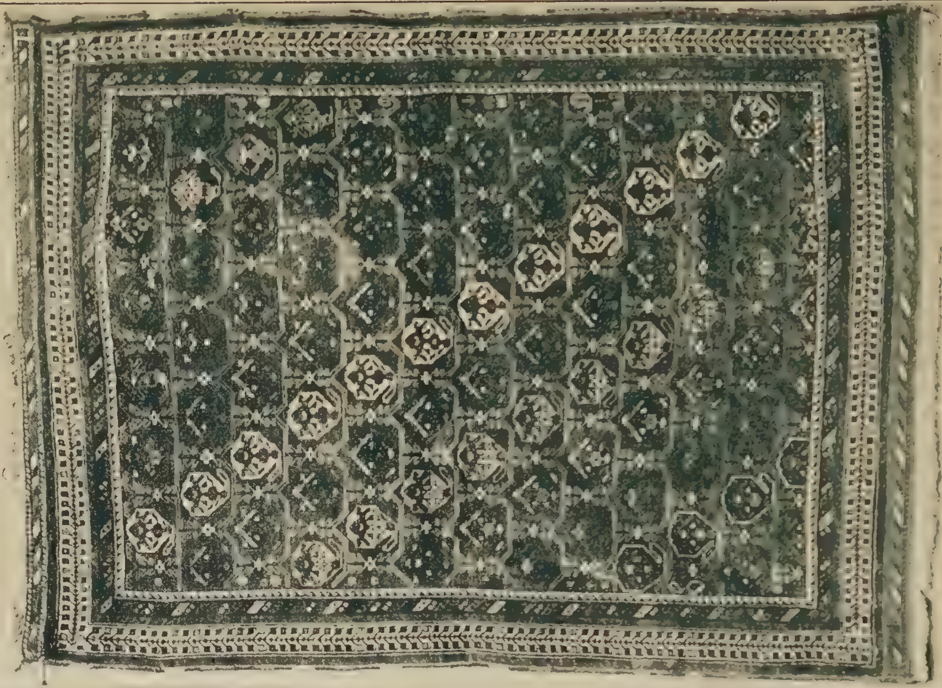
The greatest charm of Oriental rugs lies in the simplicity of construction, in the impress of individuality of effort and in the incomprehensible mystery of design. The manner of their making is primitive; the materials used



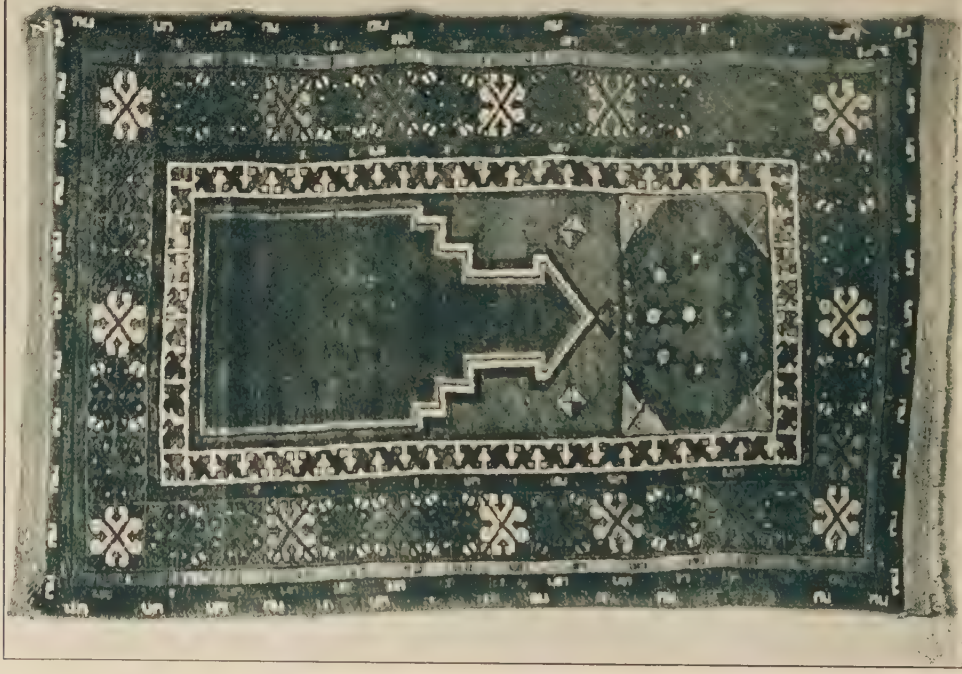
Caucasian Rug



Indian Rug



Persian Rug (Shiraz)



Turkish Rug

are all home made, and the ornamentations in odd lines, angles, squares or in grotesque likenesses of «fish, flesh and fowl,» the original meanings of which are forever buried in the first ages of mankind — these, and the wonder of their marvelous colorings, the secret of many being still hidden and many another being entirely lost, add to the teasing witchery of the Oriental rugs.

**Names.**— To the uninitiated, of the many unsatisfactory peculiarities concerning the subject, the naming of Oriental rugs is the most perplexing. There is no fixed rule that would classify clearly the enormously diversified output of rugs within the vast area of about three-quarters of the continent of Asia. There are, however, six recognized geographical divisions, which include about all Oriental rugs of our day, namely: (1) Persian rugs; (2) Turkish rugs; (3) Caucasian rugs; (4) Turkoman rugs; (5) Indian rugs; (6) Chinese rugs.

**Persian Rugs.**— Persia, the home of floral ornamentation, and the most marvelous exponent of textile production of the Orient, stands on the pinnacle of fame by unanimous consent. She attained this enviable position especially during the benign reign of Shah Abbas, in the 16th and 17th centuries, under whose wise encouragement she reached the golden age of the rug industry.

The Ispahan rugs made under Shah Abbas, with their gorgeous field of «Ispahan red,» decorated in tulip, rose, lotus, iris floriations, fastened together in chiseled tracery of refined meandering lines and angles at once puzzling and fascinating established a new epoch of the rug industry, never equalled since.

A somewhat similar pattern of the Ispahan having been evolved, the glossary of Persian rugs was enriched by another famous type of pattern which they called the «Shah Abbas,» after that most honored monarch of Persia. The Ispahan rug, as a class, stands alone, and its species is almost extinct, the very few perfect specimens and even fragments being jealously preserved in museums or in private collections.

Persians, who ought to know best, divide their rugs into the following groups according to ornamentation mostly, which is different from the accepted division in common use abroad: (a) Kirman; (b) Herati; (c) Iran; (d) Hamadan; (e) Kurdistan.

(a) The Kirman group is subdivided into the following celebrated specimens: (1) Kashan; (2) Kirman or Kirmanshah; (3) Saruk; (4) Tabriz. The chief characteristics of this group lie in their extreme fineness of texture, brilliance of coloring and purely floral ornamentation, which is carried to its highest perfection.

Mostly of modern construction, but copies of some old forms, with floriated medallions or panels or scrolls, replete with vases of flowers, and representations of birds or beasts, these rugs show the scintillating splendor of jewels in textile art; and they command high prices on the American market.

(b) The Herati group includes: (1) Meshed; (2) Khorassan; (3) Shah Abbas; (4) Feraghan; (5) Joshaghan; (6) Youraghan.

To the heart of a true son of old Iran, this group of rugs is the most precious of all, for here are preserved the glorious traditions of his forefathers; here, the holiest shrine of his faith; here, the revered name of his most illustrious shah and, here, the true splendor of his matchless artistry. The chief excellence of this group is in the development of the leaf pattern; be it the palm leaf, the rose leaf, the lotus leaf or the so-called river-loop design; it fills a very prominent part of ornamentation either in a curled position as in the Feraghan, or spread out on borders, corners and medallions as in the Meshed and Khorassan, or in groups and clusters of splendid tracery as in the Shah Abbas.

(c) The Iran group contains the following popular specimens: (1) Teheran; (2) Mihr; (3) Saraband; (4) Shiraz.

Most worthy of mention and very much admired by all Orientals are the Saraband and Shiraz rugs, besides the Mihr, which really is the finest grade of Saraband.

The characteristic peculiarity of these, especially of the Mihr and Saraband, is the palm leaf pattern, row upon row, on a field of red or blue but seldom ivory, each row of palm leaves facing in an opposite direction.

In the Shiraz rugs the palm leaf design, if employed at all, is used without regard to regularity or size. The Shiraz rugs show an utter disregard to conventional patterns, therefore they are among the most interesting rugs of the Orient. Often medallions run through the centre which are decorated with flowers, leaf patterns, birds and animals much after the style of Kirmans. But the distinguishing points are: the salvages overcast in two or more colors with tassels here and there and the two ends finished with pretty needlework patterns.

In the Teheran the patterns may or may not show the palm, but they are kindred rugs in all other respects.

(d) The Heriz group contains: (1) Ardebil; (2) Hamadan; (3) Bakhshaish; (4) Gorovan; (5) Serapi.

In these rugs, the medallion with its various modifications is carried out in a most pronounced fashion; especially in the Gorovan and Serapi, where the medallion stands out in barbaric outline upon a field of red, white, blue, green or brown hues of great brilliancy.

In the Heriz and Hamadan, the undyed hair of the camel plays a prominent part, often covering the whole rug, decorated with rosettes, medallions, pendants and heavy traceries, all interwoven in bold contrasts. In the Ardebil and Bakhshaish and the Heriz proper, these striking contrasts are entirely eliminated, indeed, these show such superb mellowness of coloring, graceful lineations and superior floriations, that they bespeak of times of long ago.

(e) In the Kurdistan group are included the following specimens: (1) Sehna; (2) Bijar; (3) Lullé.

It would seem that the Sehna rug should not fall under this heading, for there is no similarity of style or texture to the Kurdistan; but the people of Persia class this rug as a Kurdistan.

The Sehna, so far as fineness of texture is concerned, belongs to the Kirman group, and not infrequently surpasses even the best Kashan texture of the Kirman group. Hundreds of knots are crowded in a space of one square inch with shortest cut yarn until it becomes almost beyond belief that human fingers are capable of producing such a fabric.

The Sehna rug shows no reckless disregard for design or color; whether rosettes or palm patterns or medallions, every line is clear-cut, every curve masterfully rounded and every color faithfully reproduced. The Sehna is the thinnest rug made in the Orient.

In strongest contrast to the Sehna are the Bijar and Lullé of the Kurdistan; they recognize no established pattern; accept no school of coloring and follow no rule of texture.

Generally thick and heavy in texture, employing all the standard Persian designs without regard to fitness or uniformity of position on lustrous fields of rich and deep coloring; whether coarse or fine, heavy or light, these rugs compel admiration by reason of their extraordinary solidity.

**Turkish Rugs.**— In the Turkish Empire live many races, peoples and religions, which are not at all affiliated with one another — remnant nations of Syria, Babylonia, Armenia — Chaldea, Greece, Palestine, etc.— consequently, the textile productions of this region are somewhat mixed and rather difficult to classify. It appears, however, that the Turkish detached mode of ornamentation repeated on some parts of rugs, and the generous use of both floral and geometrical designs usually seen in all Turkish products, would give them a certain distinction; add to this the very popular pattern found in the prayer rugs, and the Turkish rugs become an individual class in the family of Oriental rugs.

Moreover, most Turkish rugs are coarser than Persians, their pile being longer, looser, thicker and softer.

The people of Turkey divide their rugs into the following principal specimens: (a) Ghiordez (Yordez); (b) Koulah; (3) Ladik; (d) Melez; (e) Berghama; (f) Koniah; (g) Kir-Shehir; (h) Kutahia; (i) Mousul; (j) Kurd; (k) Yuruk; (l) Anatolian.

(a) In conception of design, execution of workmanship and combination of coloring, the Ghiordez stands first in all Turkish rugs, and is most highly praised by Turk, Greek, Armenian, European and American alike.

Usually made of prayer-rug designs, the field has a solid coloring of ivory, blue, red, sometimes green, with the niche or dome resting on two ornamented columns; but at times the columns being absent, the dome is supported by highly conventionalized patterns of the tree of life.

A wide border, generally of the same coloring as of the field, is decorated with flowers and configurations so clustered as to form a superb square, which is repeated on the four sides of the rug, and frequently on the panels, over and under the enclosure of the praying niche pattern.

Two or several narrow borders in detached patterns surround the principal border; and on the two upper corners filling the trigonal spaces of the praying dome, are distributed figures bearing a resemblance to the main border. Often a bejeweled lamp hangs down from the centre of the dome.

The colorings of the Ghiordez of old are impossible to describe appropriately, and it might be added with truth, equally impossible to reproduce in color.

(b), (c), (d) Koulah, Ladik, Melez, these three are kindred rugs to the Ghiordez, but they are not equal to the latter.

In Koulahs, the praying dome is often indented or otherwise misshapen, and the field, instead of a solid color, is decorated with patterns. It is marked also with several narrow stripes, for border, with startling contrast of colors.

The Ladik may be called a better rug than the Koulah, for it often possesses beautifully subdued greens, deep reds, blues, all blended attractively.

The Melez might be named as twin sister to the Ladik, for it has all her characteristics, and only the trained eye can properly distinguished between them.

(e), (f) Berghama and Koniah rugs generally show medallion designs and a field well covered with geometrical patterns; they have also wide attractive borders covered with floral decorations. In form these rugs are made nearer square than other Turkish productions, with a heavy, silky pile and very attractive colorings.

(g) The Kir-Shehir products, prayer-rug design or other, generally small rugs possess much resemblance to Ladik and Melez, they are, however, coarser rugs with brighter colorings and with unpleasant contrasts.

(h) Kutahia, or Kutais, is a longer rug than the foregoing specimens with no special characteristic in design or coloring: A satisfactory rug usually, with silky surface, pleasing design and fine coloring.

(i), (j), (k) Mousul, Kurd, Yuruk. Strictly these three grades do not belong to the Turkish family of rugs, yet neither could they be classified under the Persian group, and since the provinces in which they are made fall under Turkish rule it is proper to call them Turkish.

In design, in texture, in workmanship, these are the «heavy-weights» in rugs. There is coarseness, boldness and a wild strength in these rugs, which indicate the mountain, the desert and the ravine; usually made of good wool and of good coloring (often exceptionally good), they lack the refinement of a Herati or the exquisiteness of a Ghiordez.

The Kurd and the Yuruk, especially, show an utter disregard for regularity of design or texture; sometimes long and shaggy like the matted wool of a sheep, they defy any accepted school of rug making.

(l) Anatolian.— There are several other grades made in Turkey, especially small mats, which are covered by this name. The Anatolian rug is usually of heavy quality and not very fine, but in coloring surpasses many others. The wool is exceedingly soft, and the colors frequently of primary dyes, and when mellowed by age, it develops a sheen which rivals silk productions.

**Caucasian Rugs.**— In Caucasian rugs, the geometrical ornamentation is carried to its perfection. All conceivable designs in line are employed with great profusion and bewildering effect. Generally there is one principal color to which all other colors are subjected in clear-cut designs, sometimes without shading, giving the effect of inlaid stonework.

In texture Caucasian rugs are medium, although there are some exceedingly fine specimens made, but these are exceptional.

In size these rugs are not very large, sometimes they are made long and narrow, but mostly of medium size.

In designing they show star shapes, circles, fretwork, insect shapes, diamonds, triangles, various forms of the Swastika, squares, medallions, dragons designs, etc.

These are the following principal well-known kinds of rugs made in Caucasia: (a) Daghestan; (b) Kabistan (Kuba); (c) Shirvan; (d) Darbent; (e) Karabagh; (f) Kazak; (g) Chichi; (h) Circassian; (i) Kashmir (Soumak).

The Daghestan, the Kabistan and the Shirvan are rugs made on similar lines. Their colors, designs and texture are not different from each other, except the Kabistan, which is usually of finer construction. The geometrical elongated star and the Swastika and other lineal decorations are common to all, with beautifully vivid colors attractively arranged.

The Darbent rug shows a strong, barbaric nature like that of the Kurd and Yuruk, only in the Darbent there is more uniformity of design, and the texture is not so coarse.

The Karabagh rug shows more of the Persian mode of designing than any other Caucasian rug. Upon its black or brown field are strewn, at regular distances, magnificent delineations of leaf and flower patterns in various shades of tan and old magenta colors — but this is the Karabagh of olden times. The modern product is a mixture of homely designs, crude dyes and coarse weaving, showing a careless haste in workmanship.

The Kazak rugs are the heaviest of all Caucasians and different in floriation. It appears that the makers of these rugs have endeavored to develop the gruesome in design, for on their products are shown various grotesque shapes of the dragon and other creeping creatures with startling effect. One distinguishing point of Kazaks is in their size which is nearer square than any other Caucasian product; another is in the peculiar quality of the twisted yarn, which, when untwisted after years of usage, is divided into hundreds of fine ends making the surface of the rug like a smooth velvety lawn.

Chichi rugs are made fine usually, and differ from other Caucasians in ornamentation. On a dark or light colored field are distributed regular patterns in cut squares or rectangular forms, giving the appearance of a latticed panel.

Circassian rugs depart entirely from Caucasian mode of ornamentation. These are among the choicest, if not the choicest products of this region. A favorite design consists in a pattern of superb flowers in full bloom, or foliage artistically clustered and connected one with the other by graceful long lines.

Kashmir (Sumak or Shamakha) rugs are devoid of nap; they are made in what is commonly known as the flat stitch style like the old Kashmir shawls of India from which they derive the name. In design they are typical Caucasians, and by reason of the absence of the nap they show their designs in bold relief, clear cut and prominent. The long ends of the yarn, left on the back, give weight and softness of texture.

**Turkoman Rugs.**—There are two divisions of the Turkoman rugs: Western and Eastern. In the Western Turkoman rugs the chief color, universally employed, is red with all its shades and kindred colorings, and the principal design, the octagonal or Bokhara; embracing the following well-known specimens: (1) Bokhara; (2) Afghan, or Khiva; (3) Yomud; (4) Bushir; (5) Beluchistan.

Of these, Bokhara rugs are the finest and most valuable. It is impossible to mistake the Bokhara after once seen. The octagonal device, in shades of blues, ivory and reds, is stamped on every Bokhara upon a field of some shade of red. The octagonal pattern is divided into four, with the diagonal sections resembling each other. They are the finest of all Turkomans in texture and sometimes so fine that they rival the best productions of Persia.

The prayer-rug of this class preserves the general characteristic color of red. It, however, shows no octagonal device; there is the usual dome pattern in a more pointed shape near the top; and the whole rug, usually about four feet by five, is divided into four sections, decorated with highly conventionalized devices of the Swastika.

Afghan or Khiva rugs, made of coarser texture and of larger size, adhere to the Turkoman red and octagonal pattern most faithfully—in the large regularly arranged octagon is often seen clover leaf and sometimes a portion of dragon designs. Rich in coloring, heavy in pile, these rugs frequently mellow into lustrous and velvety fabrics.

The Yomud rugs are of darker shades of the maroon; and the detached regular octagon is transformed into an elongated diamond design fringed with dragon claws or Swastika devices. The Yomud usually is of very fine texture and is made in large size.

Bushir rugs classed herein are Turkoman only in coloring and texture. They show no octagonal pattern; often being decorated with palm devices; sometime with Herati designs, and with ornamentations generally found in Caucasians. Made in rather longish sizes, loose texture, strong, silky and desirable.

Beluchistan rugs are another class of the Turkomans which bear no resemblance to the Bokhara. Generally small in size, they deviate from the red shades often, and show subdued shades of maroon, blue, ivory, camels' hair and, rarely, green. In design they employ the floral as well as geometrical forms. The general effect of Beluchistans is dark.

Eastern Turkoman rugs may be subdivided into: (1) Ganji or Genghis; (2) Samarkand; (3) Kashghar; (4) Yarkhand.

The Ganji rugs are made by Turkoman nomads, of goats' hair or wool with long silky texture, the principal color being white or yellow, on which are spread at regular distances rather crude geometrical devices.

Samarkand rugs reveal Chinese characteristics in coloring and design — usually of yellow, tan or red and blue, they have several round figures intersected with strange floral designs and geometrical patterns.

The fret decoration is pronounced on their borders. Heavy and rather coarse in construction these rugs are attractive by reason of their simplicity of designing and uniqueness of coloring.

Kashghar rugs, coarse in texture, are stolid in design and simple in coloring. Often only three different colors appear — a solid color for the field, another solid color for the simple geometrical design and a third to separate the lines and to mark the borders. These and the Yarkhand rugs similar to these rarely leave their native places, the easternmost part of Turkestan.

**Indian Rugs.**— Strictly speaking India sends out only large carpets, the manufacture of which is in the hands of European and American firms, who have established great centres of production in the Punjab, Kashmir and Madras districts, commonly known as Agra, Lahor, Amritzar, Mirzapur, Kandahar, Ardahan, etc. Arbitrary names these last, given by the manufacturers themselves without regard to location.

These American and European houses not only control the output of rugs but also their ornamentation and coloring; they make rugs to order, according to the colors selected and patterns required by their customers. Thus individuality and character is altogether wanting in these productions, albeit they are made to endure, being heavy, closely woven and of attractive colorings.

Mr. Ruskin sums up the deteriorating effect of European control on the Indian rugs in the following manner: «Modern commercialism has laid its poisonous trade upon this useful industry since the days when I was a young man and to-day it is almost ruined as an art.»

It may be added that to-day «this useful industry . . . as an art» is altogether ruined with no hope of its revival.

**Chinese Rugs.**— It is a matter for the historian to decide whether or not the Chinese are the original rug makers of the world; it is evident, however, that rugs were made in China a very long time ago and some of them of surpassing beauty; thus the white silk rug taken to Mecca as a covering for the holy shrine of Kaaba antedated by hundreds of years the appearance of the great prophet of Arabia.

Chinese rugs form a distinct type, their designs consist of all kinds of odd geometrical devices, all imaginable curves and angles and many quaint configurations of the Swastika or the lotus flower which are distributed with unique formations on fields of yellow, blue, red, fawn, gold and tan in all their exquisite shades marvelously blended.

The Chinese mode of ornamentation may be called the kaleidoscope of texture. Generally of long, soft wool or silk or camel's hair these rugs while not made as fine as some Persian rugs, still reveal masterly skill in texture with irridescent sunset colors and magnificent sheen. They are among the most valuable of all Oriental rugs and among the rarest on the European or American market; and they command the highest prices.

**Kilims.**— Kilims, while products of the Orient, are not rugs, for they possess no pile and their mode of construction is different.

Kilims resemble the Kashmir or Shemakha rugs and are made in the same manner, that is on the flat stitch plan, with this difference, however, that while the loose ends of the yarn are left on the back of Kashmir rugs, in Kilims they are wound around the woof, and in changing the yarn to change the color also a separate warp thread is taken up, thus leaving a small oblong open space between the two stitches. Kilims thus made present the open work effect in texture.

Kilims are of lighter weight, often both sides being alike and are not appropriate for floor coverings. They are the tapestries of the Orient, and in whatever district made they follow the usual rug pattern of that district. The finest Kilims are made in Sehna, where the finest rugs are made, in Persia; and also in Bokhara. Small Kilims made in Turkey are often called Kiz-Kilim; woven by the hands of Turkish maidens for purposes of dowry or devotion, or for presents to their marriageable friends and relations, they are, therefore, highly decorative and often with unusually beautiful designs. Kilims are made also in Caucasia and Kurdistan known as Shirvan and Kurd Kilims respectively.

In the Orient their use is manifold — as rugs, hanging both for doors and walls, and for tents, as mantles by day time and covering by night for travelers; made for bags and covering for bags, and also for covering of the person; they serve for other conveniences entirely unknown in civilized communities. See PRAYER RUG.

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B. PESHMALYAN.

**RUGS, Weaving of.** The commerce in Oriental rugs in the United States, especially those from Persia, Russia and Turkey, is very considerable. A few came from India and China, and some are woven in Afghanistan and Beluchistan. While there is a large production of rugs of various kinds in America, the imported rugs continue to hold high favor among American buyers. Many of the costly Eastern rugs are as simply woven as a Navajo blanket, an Indian product, or even as a rag carpet. The process is in many cases, almost identical, the variation being only in closeness or fineness of warp and arrangement of color. The manufacture of rugs in the United States is an industry of considerable importance. A great variety of weaves is produced — woolen, cotton and grass rugs, in some cases after European models and methods and in others after original designs and methods of construction, both as to the machinery used, the dyeing of the fabrics and the designs. Grass rugs for the country house have recently won prominence in our domestic commerce. Some of these are made of tough fibres and others of less durable material. Some have their colors woven into the mesh and some have stencilled designs in fast colors.

Another phase of the weaving of rugs in the United States is their manufacture in the home. Rag carpets have been made and used in farmhouses for many generations, but of late there has been a general demand, especially in country houses, for home-made piazza rugs, bedroom rugs and rugs for general use. An authority on the home weaving of rugs is Mrs. Candace Wheeler, whose recent work on ‹How to Make Rugs› is a practical handbook. In it the Onteora, the Lois, the Isle La Motte, the Lucy and other home-made designs are described. The pattern, the dyeing and braiding the fringe of the border all are featured in detail. This writer states that «the cumbrous old woolen loom is still doing a certain amount of work in every country neighborhood, and is capable of a greatly enlarged and much more profitable practice. I find very little, if any difference in the rugs woven upon these and the modern steel loom. It is true that the work is lighter and weaving goes faster upon the latter, and where a person or family makes an occupation of weaving, it is probably better to have the latest improvements, but it is possible to begin and to make a success of rag-rug weaving upon an old fashioned loom.» In the matter of pattern and coloring it is stated that the Onteora rug is made by using a proportion of half a pound of blue rags to the two and a half white required to make up the three pounds of cotton needed in a six-foot rug. The side border in the Lois rug is made upon the same blue warp, is separately woven and afterward added to the plain white rug with blue ends. Many of the rugs described by Mrs. Wheeler are washable. Her work also has been the building up of neighborhood industries in domestic rug making, a labor which has taught both economy and art.

The larger subject of the domestic manufacture and commerce in rugs made in the United States may be broadly considered under the general subject of carpets (q.v.). The principal varieties of carpets now in use are the Turkey, the Axminster, the Brussels, the Wilton, the Venetian, the Dutch, the Kidderminster or Scotch, the Whytock's tapestry and velvet pile, and the printed felt carpet. Generally speaking, rugs, whether made in England or the United States, have somewhat similar designations and are similar in appearance though made on the most modern looms. A very beautiful fabric has also been introduced, called the Patent Wool Mosaic.

**RUHMKORFF,** room'kŏrf, **Heinrich Daniel,** German inventor: b. Hanover, 1803; d. Paris, 21 Dec. 1877. He removed to Paris in 1839, where he continued to reside. In 1851 he invented the induction coil which bears his name.

**RUISDAEL,** rois'däl, or **RUYSDAEL, Jacob van,** Dutch painter: b. Haarlem, 1626; d. there, 1682. He was the son of a painter and probably studied art under his father and an uncle, who was also a painter. In 1648 he entered the guild of his native city and some nine years later settled in Amsterdam, where he received citizen rights in 1659. He appears to have traveled throughout his native country and in parts of Germany and Switzerland. Ruisdael was not much appreciated during his lifetime, but is now ranked among the greatest of the Dutch landscape painters. His pictures, comprising well-chosen forests, waterfall, shore, mountain and similar scenes, are often of a melancholy, but always of a deeply poetical character. The figures in them were painted by Berchem, Van de Velde, Van Ostade, Wouwerman, Lingelbach and others. All the chief European galleries contain examples of his work, the number in the National Gallery being 12. Consult Michel, ‹Jacob Van Ruisdael et les Paysagistes de l'Ecole de Haarlem› (1890).

**RUIZ,** roo-eth, **Juan,** Spanish poet: b. about 1283; d. 1350. He is frequently called the archpriest of Hita. Very little is known of his life; and the time and place of his birth are uncertain, Guadalajara and Alcolá (de Henares) both claiming to be the latter; for honor it certainly is since he is easily the greatest of the early Castilian writers. It is known that he was cast into prison by order of Cardinal Don Gil, archbishop of Toledo, and he probably died there. At any rate he seems to have remained in prison some 13 years and to have composed most of his works there. His poems are stamped with the immorality of the age, but they are simple, imaginative, varied in form and very wide in range of subject. Throughout them are freely scattered fables, sayings, precepts and proverbs that have become an integral part of the Spanish language, if indeed most of them had not already attained to that distinction before Ruiz wove them into his poems. His ‹Libro de buen amor,› which seems to have been written while he was in prison, shows a considerable variety of talent, power of expression, breadth of imagination and ability to seize upon the interesting, picturesque and graphic. Ruiz possesses strong satirical humor and boldly attacks the vices of his day even in the body of the Church, while at the same time showing himself as devoid of any moral standard as those he holds up to ridicule. He is at times reflective and devotional; but this is far from his customary mood; it is rather one of licentious immorality which instead of attempting to hide or gloss over, he rather glories in. The fact that a priest could openly express himself as Ruiz does, offers an excellent commentary upon the customs and the morals of the age. Ruiz is a skilful versifier and his genius is more universal than any of his contemporary countrymen. In fact he has frequently been compared to Chaucer. But while he has much of the vivacity of Chaucer and his ability for narration, he has not his power of character painting. He strikes the personal note in a way never attained by Chaucer, and which reminds us in some respects of Byron. Ruiz is even bolder and more cynical in his burlesques of the priests and the Church. The whole paraphernalia of the Church, including «clerks and laymen, monks, nuns, duennas and gleemen,» he sends forth to meet and welcome love at Toledo. In his bold humor he fears nothing and dares everything. Everywhere he strikes the personal note; and his verse and his thoughts flow with freedom heretofore unknown in Spanish literature. Consult Cejador y Frauca, J., 'Juan Ruiz' Libro de buen amor' (annotated ed., Madrid 1913); Ducamin, J., 'Libro de buen amor de Juan Ruiz' (Toulouse 1901); Fitzmaurice-Kelly, 'Chapters on Spanish Literature' (London 1908); Ticknor, G., 'A History of Spanish Literature' (New York 1854).

**RULE, William Harris,** English Wesleyan Methodist clergyman and historian: b. Penryn, Cornwall, 15 Nov. 1802; d. Addiscombe, 25 Sept. 1890. He was practically self-educated and was ordained in 1826. In the succeeding year he was resident missionary at Malta and in 1827–31 he was missionary at Saint Vincent, West Indies. He was pastor at Gibraltar in 1832–42, and held pastorates in England in 1842–68, serving as chaplain at Aldershot Camp in 1857–65. He was supernumerary pastor at Croyden after 1868. In 1851–57 he was joint editor of the Wesleyan publications. He was a man of high linguistic attainments and is said to have mastered 10 languages. Author of 'Memoir of a Mission to Gibraltar and Spain' (1844); 'Martyrs of the Reformation' (1851); 'Celebrated Jesuits' (2 vols., 1852–53); 'The Religious Aspect of the Civil War in China' (1853); 'History of the Inquisition from the Twelfth Century' (1868; 2d ed., 2 vols., 1874); 'Councils, Ancient and Modern' (1870); 'Recollections of Life and Work at Home and Abroad' (1886), etc.

**RULE BRITANNIA,** one of the national songs of Great Britain, the joint production of James Thomson and David Mallet, first performed before Frederick, Prince of Wales, at Cliefden House, 1740. It runs as follows:

When Britain first at Heaven's command
Arose from out the azure main,
This was the charter of her land,
And guardian angels sung the strain:
Rule, Britannia! Britannia rules the waves!
Britons never shall be slaves.

The nations not so blest as thee
Must in their turn to tyrants fall,
While thou shalt flourish great and free,
The dread and envy of them all.

Still more majestic shalt thou rise,
More dreadful from each foreign stroke;
As the loud blast that tears the skies
Serves but to root thy native oak.

Thee haughty tyrants ne'er shall tame;
All their attempts to bend thee down
Will but arouse thy generous flame,
And work their woe and thy renown.

To thee belongs the rural reign;
Thy cities shall with commerce shine;
All thine shall be the subject main,
And every shore it circles thine!

The Muses, still with Freedom found,
Shall to thy happy coast repair;
Blest Isle, with matchless beauty crowned
And manly hearts to guard the fair:—
Rule, Britannia! Britannia rules the waves!
Britons never shall be slaves!

**RULE OF FAITH.** See FAITH, RULE OF.

**RULE NISI,** nī'sī, or **RULE TO SHOW CAUSE,** in English and United States law, an order granted by the court on an interlocutory application (formerly always *ex parte*), directing the party opposed to the applicant to do or abstain from some act unless (*nisi*) he can show cause why the order should not be obeyed. If cause is shown, the order is «discharged,» otherwise it is made «absolute.»

**RULE OF THREE.** See PROPORTION; ARITHMETIC; ARITHMETIC, HISTORY OF.

**RULES OF THE ROAD,** the body of regulations which, coming into use either by custom or by statute, govern and regulate traffic on land and water ways. The object of such regulation is to afford to all their reasonable rights in the highway with the maximum of safety. It is a general rule in the United States that two vehicles meeting on a highway keep to the right to permit each to pass the other. On the other hand when one vehicle overtakes another it passes to the left of the vehicle overtaken. At night it is a general rule that all vehicles must have adequate lights. With the advent of the automobile a great number of regulations have been enacted by States and municipalities.

The rules for water craft sea-going types were formulated and agreed upon in 1897. These rules govern lights to be displayed, fog, distress and other signals, steering, etc.

**RULING MACHINES,** in blank-book manufacture and bookbinding, are instruments used for ruling paper, metal, etc. The first machine of this kind was invented by a Dutchman, resident in London, in 1782, and was subsequently greatly improved by Woodmason, Payne, Brown and others. F. A. Nobert devised a ruling machine in 1845 for the production of microscopical test plates, diffraction gratings and micrometers, etc., and more recently Benjamin Day, a New York artist, patented one for use by artists.

**RULLUS, Publius Servilius,** Roman tribune of the people in 64 B.C. He is famous for his proposal of a law which provided for the purchase and distribution by the state of land for the poorer classes, thereby abolishing pauperism. The law was to be administered by a commission of 10, elected for five-year terms, and the money required was to be raised through the sale of property of the state and of lands and provinces acquired by the state since 88 B.C. The proposed law granted wide powers to the commission and was considered open to a suspicion of ulterior political purposes. It failed to become a law. One of its chief opponents was Cicero, who delivered four speeches against it. Three of these still exist, 'De lege agraria.'

**RUM,** a distilled liquor obtained from the fermented juice of the sugar-cane or molasses. Rum owes its flavor to a volatile oil and butyric acid, a fact which has been utilized to prepare a butyric compound called essence of rum to enable the spirit-dealer to manufacture a fictitious rum from malt or molasses spirit. The color is usually imparted after distillation by adding burnt sugar or caramel.

**RUM, ROMANISM AND REBELLION,** a phrase celebrated in American political history. At a meeting of clergy, in which all denominations were supposed to be represented, held in the Fifth Avenue Hotel, New York, during the Presidential campaign of 1884, in the interest of the Republicans, Rev. R. B. Burchard described the Democrats as the party of «Rum, Romanism and Rebellion.» This remark was unfortunate for the Republicans and helped in a great measure to win the election for the Democrats.

**RUMANIA**, roo-mān'nĭ-ạ, or **ROUMANIA**, a kingdom of southeastern Europe, bounded by Hungary, Ukraine, the Black Sea, Bulgaria and Jugo-Slavia. Area, 122,282 square miles. It comprised the provinces of Moldavia and Wallachia, prior to 23 Dec. 1861, Danubian principalities. The principal towns are Bucharest, the capital, Jassy, Galatz, Braïla, Botosai, Ploësti, Craïova, Berlad, Foscani.

**Topography.**— The surface consists mainly of undulating and well-watered plains of great fertility; from the Carpathian Mountains on the north and west borders, where the summits range from 2,600 feet to 8,800 feet, they gradually slope downward to the river Danube which for 595 miles flows through Rumanian territory, and with Bulgaria forms the major portion of the southern boundary. The entire kingdom is in the basin of the Danube, the chief Rumanian tributaries of which are the Alt or Aluta, the Arjish, Jalomnitza, Buzeo, Sereth, Berlad and Pruth. The Danube forms a number of marshy lakes as it approaches the alluvial region of the Dobrudja, which is mostly a land of steppes and marshes, unhealthful and uncultivated, through which the Danube discharges itself into the Black Sea by the Saint George, Sulina and Kilia channels.

**Geology, Natural Resources, etc.**— In the region of the Carpathians the geology is of the Tertiary period practically completed at the end of the Miocene period and almost entirely composed of primitive rocks. The kingdom possesses considerable mineral wealth; rock-salt abounds in the vicinity of the Carpathian Mountains, and the salt mines of Wallachia are apparently inexhaustible. Petroleum and asphalt are abundant; a great quantity of saltpetre is produced, chiefly in the northern part of the country; sulphur is found in more limited quantities. The only metal of importance is copper, which has been worked to some extent; gold is washed from the sands of several streams, however. About one-sixth of the surface is covered with forests of oak, fir, beach and other valuable timber trees.

The fauna includes stags, bears, wolves, foxes, wild goats, wild boars, hares and martens; while fish abound in the rivers. The climate is subject to greater extremes than at the same latitude in other parts of Europe. The summer is hot and rainless; the winter, sudden and severe, the Danube and its tributaries being regularly frozen for about six weeks; there is almost no spring, but the autumn is long and pleasant. Rumania is an essentially agricultural and pastoral state, fully 70 per cent of the inhabitants being directly engaged in husbandry. The chief cereal crops are maize, wheat, barley, rye and oats; tobacco, hemp and flax are also grown, and wine is produced on the hills at the foot of the Carpathians. Cattle, sheep and horses are reared in large numbers.

**Manufactures, Commerce, etc.**— Since the passing of the law in 1887 for promoting national industries some progress has been made in manufactures, chiefly along the line of domestic commodities. Trade is fairly active, but is almost entirely in the hands of foreigners; the internal trade is chiefly carried on by Jews, who are subject to certain disabilities. The chief exports are grain (especially maize), cattle, timber and fruit; the chief imports, manufactured goods, coal, etc. Germany, Great Britain and Austria-Hungary appropriate by far the greatest share of the foreign trade, the bulk of which passes through the Black Sea ports. In 1913–14 the exports were valued at $134,141,060, the imports at $118,002,520. In 1914 there were 2,299 miles of state railway, 5,618 miles of telegraph lines and a rapidly extending telephone system. The government monopolizes also salt and tobacco. The French decimal coinage has been introduced, the franc being called *leu* (pl. *leï*), the centime *bari*. The metric system of weights and measures has also been officially recognized, but a diversity of local standards is still common.

**Government.**— Since 1881 the ruler of Rumania has had the title of king, in accordance with the decision of the Rumanian Parliament. Previously the title was prince, or in Rumanian «Domnu» (Lat. *dominus*, lord). The father of the present ruler was elected by the people, but the dignity is hereditary. There are two legislative houses, a Senate of 120 members elected for eight years, and a Chamber of Deputies of 183 members elected for four years. The members of both chambers are chosen by indirect election, the first voters choosing electors, and these in their turn the deputies. A deputy must either belong to a learned profession, to a military or civil service or have an annual income of about $2,000, and must be 25 years of age. All citizens of full age and paying taxes are electors. The sovereign has a suspensive veto over all laws passed by the two chambers. The executive is in the hands of the sovereign assisted by a council of eight members, the heads of the departments of the Interior, of Finance, of War, of Foreign Affairs, of Justice, of Agriculture, Commerce and Public Works and of Public Instruction and Worship. For purposes of local government Wallachia is divided into 17, Moldavia into 13 and Dobruja into two departments, each administered by a prefect, a receiver of taxes and a civil tribunal. Judges are removable at the pleasure of the superior authorities. The legal codes are founded on the civil law and customs of the two provinces; but though several reforms have been effected in the system of jurisprudence much yet remains to be done, especially in the administration of the law, which is said to be very unsatisfactory and corrupt. The budget estimates for 1916–17 were each $129,143,860 for revenue and expenditure. The public debt in 1915 amounted to $368,077,000.

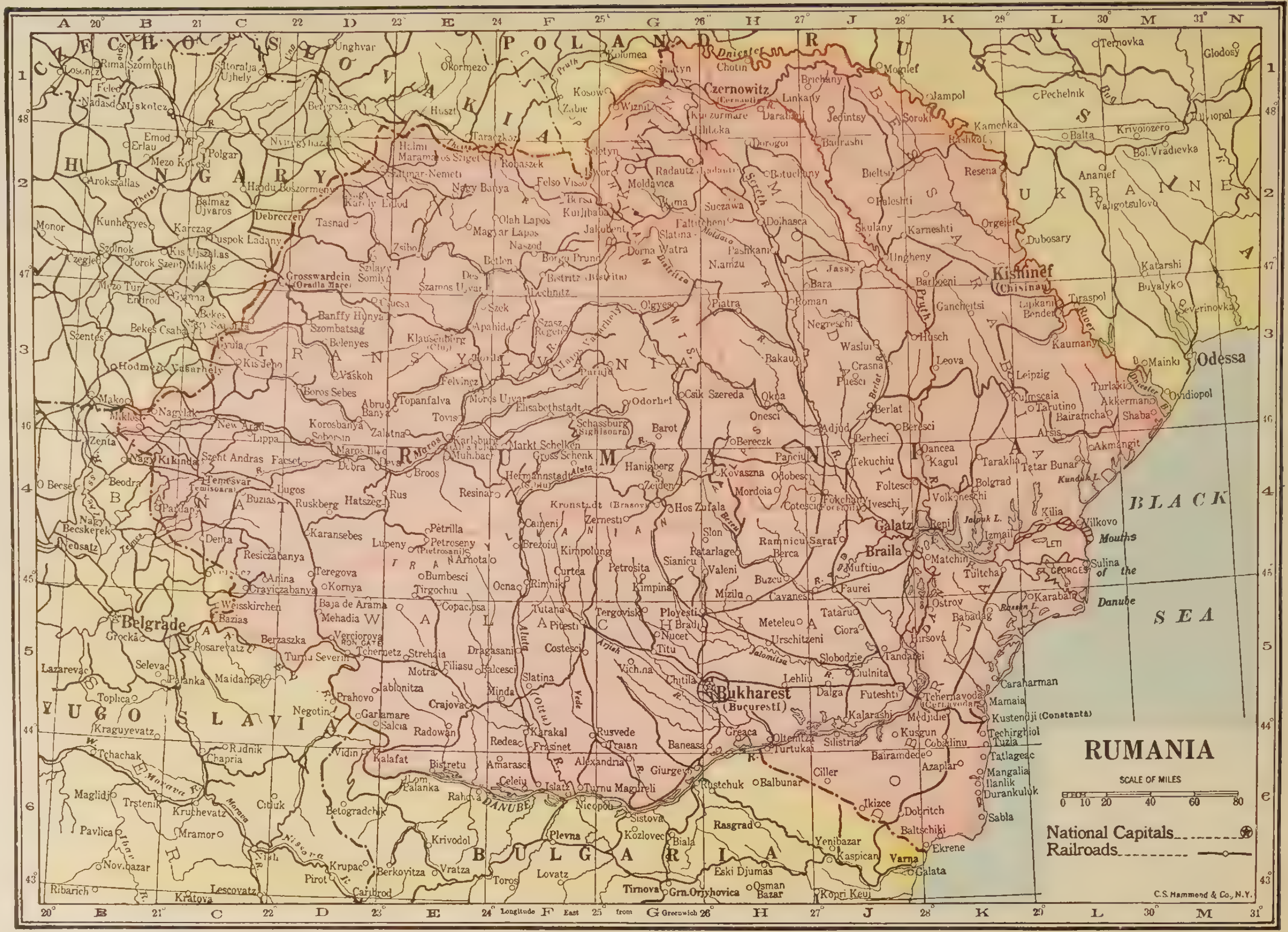
**Army and Navy.**— The military forces of Rumania are divided into five classes: (1) the permanent army, with its reserve; (2) the territorial army, with its reserve; (3) the militia; (4) the civic guard; and (5) levies *en masse*. Every male inhabitant, from the age of 21 to 46, must serve three years in the permanent army in active service and five years in its reserve, or five years in the territorial infantry and three years in its reserve. The active service in the cavalry of the territorial army lasts four years, and is followed by four years in its reserve. Whether a young man enters the permanent or the territorial army is determined by lot. Those who for some sufficient reason have not been subjected to the conscription form part of the militia, and those who have finished their term in the permanent or the territorial army also enter the militia till the age of 36. After this age, in the country they enter the levies *en masse;* in the towns, the civic guard. The peace establishment of the Rumanian army in 1914 was 5,749 officers, 124,389 men, 28,585 horses, 808 guns and 570 machine guns. The force mobilized in connection with the war 1914–1918 amounted to a total of 600,000. The effective force of the civic guard and the levy *en masse* is not definitely fixed; but altogether Rumania can put into the field about 290,000 men. The navy is insignificant, there being only one armored cruiser of any consequence.

**Ethnology and Population.**— The Rumanians claim to be the descendants of a colony of Romans located here by the Emperor Trajan, and call themselves Armâni or Romeni; hence Rumania, which is now universally adopted by the natives as the name of the united principalities. This view, however, has been seriously questioned by ethnologists of repute and may be reasonably doubted on historical and linguistic grounds. By them the evident Latinity of the language is considered of later origin. The race is certainly a mixed one, being modified by Greek, Gothic, Slavic and Turkish elements. This mixture makes itself apparent in their language; among words in common use are *apa* (Lat. *aqua*), water; *pane* (Lat. *panis*), bread; *alby* (Lat. *albus*), white; *negru* (Lat. *niger*), black; and so on. The conjugations also of the verbs, which are four in number, correspond exactly to the four conjugations in Latin. For a long time Greek was the language spoken by the court and the upper classes; but latterly this language has been largely superseded by French. The population of Rumania, according to the latest census, numbered 7,500,000. The Rumanians are in general strong and stoutly built, with black hair, brilliant eyes and a complexion similar to that of the Italians. Besides the Rumanians proper there are about 400,000 Jews, 300,000 Gypsies, 95,000 Slavs, besides Germans, Magyars, Greeks, etc. There are also large numbers of Rumanians inhabiting Hungary, Transylvania, Bessarabia, etc.

**Sociology.**— Since the introduction of railways great changes have taken place in the condition of the people. The peasants were never, properly speaking, serfs, but being compelled to work gratis for the proprietor a certain number of days every year they became fixed to that part of the country in which they were born. They are now, however, not only perfectly free, but each head of a family received during the late Prince Couza's reign a small portion of land, of which he became absolute proprietor, the landlord having been compensated by bonds bearing 10 per cent interest. Their dwellings are generally of a wretched description. Many of the towns are merely agglomerations of large houses, the residences of the boyards, surrounded by the huts of their dependents. The streets are illy paved, or, most generally, not paved at all, and are usually filthy; the roads, of which there are too few, are in most cases in a wretched state. Agricultural labor, the chief employment of the inhabitants, is cheap, as most of the laborers are so poor that they engage for work to be done three years afterward, in order to obtain advances of money. More than three-fourths of the population are peasants. Handcraftsmen are comparatively few, as the peasant usually builds his own house and makes his own furniture and utensils. In Moldavia there are about 3,000 boyards, besides an extensive lower nobility; in Wallachia they are still more numerous, every twenty-eighth man being a nobleman. There is no native middle class, and the higher ranks of society have only the law open to them as a profession. The commerce of the country is in the hands of the Jews and foreigners. The staple food of the inhabitants is maize; the common beverage is wine, which is produced in great quantities though mostly of inferior quality. This, however, is owing altogether to the manner in which it is made, and, as already stated, some good wine is also produced. The common people are good-humored, sober and cleanly, and murder and robbery are almost unknown.

**Religion and Education.**— The established religion is that of the Greek Church, to which about 97 per cent of the population belongs. At the head of the clergy are the metropolitan archbishops of Moldavia and Wallachia, the latter of whom is primate of Rumania. Each bishop is assisted by a council of clergy and has a seminary for priests. In 1863 the national finances were so low that the government was compelled to appropriate the estates of the monasteries, whose revenues amounted to about a third of that of the state, allowing in return a sum of about £700,000 for the support of the religious communities. It was determined that the balance should be devoted to the support of schools, hospitals, the relief of the poor, etc. Rumania possesses 5,000 elementary schools, 57 high schools, 8 normal schools and 2 universities, besides other special schools. Education is compulsory, but is still very backward.

**History.**— Rumania formed an important part of the Dacian territory which was conquered by Trajan and formed into a Roman province in 106 A.D. It became the battle-field of the Goths, Huns, Bulgarians, Magyars and Poles, who in succession held possession of the country for a more or less lengthy period. All these races left some traces among the Romanized Dacian inhabitants, thus helping to form that mixed people who in the 11th century were converted to the Christianity of the Greek Church. About that epoch the Kumans, a Turkish tribe, established in Moldavia an independent kingdom. Two centuries later it fell into the hands of the Nogai Tatars, who so desolated the country that only in the mountains and forests was left any trace of the native population. Toward the end of the 13th century Radu Negru of Fogarash, a petty Transylvanian chief, took possession of part of Wallachia, divided it among his boyards, founded a Senate of 12 members and an elective monarchy, and in the course of time conquered the whole provinçe. About the middle of the following century Bogdan, a Hungarian chief,


RUMANIA
SCALE OF MILES
0 10 20 40 60 80
National Capitals
Railroads
C.S. Hammond & Co., N.Y.
Longitude East from Greenwich
CZECHOSLOVAKIA
POLAND
RUSSIA
UKRAINE
HUNGARY
YUGOSLAVIA
BULGARIA
BLACK SEA
TRANSYLVANIA
BESSARABIA
MOLDAVIA
WALLACHIA
RUMANIA
Bukharest (Bucuresti)
Belgrade
Odessa
Kishinef (Chisinau)
Czernowitz (Cernauti)
Jassy
Galatz
Braila
Ployesti
Kronstadt (Brasov)
Hermannstadt (Sibiu)
Klausenburg (Cluj)
Grosswardein (Oradia Mare)
Temesvar (Timisoara)
Crajova
Kustendji (Constanta)
Varna
Danube
Mouths of the Danube
Pruth
Dniester
Sereth
Aluta
Maros
Theiss

made a successful attempt to repeople Moldavia. Struggles for the ruling power, civil and foreign wars occurred. In 1418 Wallachia was conquered by Mahomet I, son of Bajazet. Likewise in 1529 Bogdan, son of Prince Etienne, submitted Moldavia to the Porte. After the conquest of Central Hungary by the Turks, Transylvania became a principality under native Magyar princes, owning the allegiance of the Hungarian Crown, but paying tribute to the sultan as their suzerain. Thus the Rumanians in the beginning of the 16th century were induced to place themselves under the protection of the Sublime Porte, and the boyards were gradually deprived of their power to elect their own ruler, whose office was bought and sold at Constantinople. Voyvodes or dukes of various nationalities were now successively appointed, but their rule proved inefficient in establishing peace and subjection to the sultan, as the boyards never lost an opportunity of making known their dissatisfaction. One of the most distinguished foreigners was Basil Lupulo, a Greek of Epirus, who promoted civilization and learning, but was deposed in the middle of the 17th century. For a brief period at the close of the 16th century the Wallach, or Ruman, nationality was brought under the sway of a single monarch, Michael the Brave of Wallachia, who brought Moldavia and Transylvania under his sceptre. From 1732 to 1822 the country was again governed, or rather misgoverned, by Fanariot (the name comes from the section of Constantinople occupied by Greeks) princes, who merely farmed out the revenues, enriching themselves and impoverishing the land. A considerable number of the boyards, through intermarriage with the Fanariots, were more than half Greek by descent; the court language was Greek, and the religious and political sympathies of the country lay in the same direction. In 1802 Russia succeeded in establishing a sort of protectorate over the principalities, and in 1821 a desperate struggle to throw off entirely the Turkish authority almost desolated the land. In 1822 the sultan was compelled by Russia to select the princes of the provinces from natives, and seven years later to allow them to retain their office for life. In 1853 Russia took military possession of the provinces, but was compelled in a short time to retire, Turkey having received the assistance of France and England. Meanwhile, in 1848, the Hungarian Diet disposed of Transylvania by voting its formal annexation to Hungary. In the Treaty of Paris at the close of the Crimean War in 1856 it was agreed, among other things, that the principalities of Moldavia and Wallachia should continue to enjoy, under the suzerainty of the Porte and under the guarantee of the contracting powers, the privileges and immunities of which they were in possession; and that no exclusive protection should be exercised over them by any of the guaranteeing powers. The Porte engaged to preserve to the principalities an independent and national administration. In 1858 the principalities were united under one ruler, Colonel Couza, who took the title of Prince Alexander John I. In 1861 Moldavia and Wallachia were formally brought under one administration. A revolution which broke out at Bucharest in February 1866 forced Prince Alexander to abdicate, after which the representatives of the people elected as ruler Charles, son of the late Prince Charles of Hohenzollern-Sigmaringen. In the Russo-Turkish War of 1877–78 the principality sided wth Russia, but in spite of the important services which it rendered in that war, it was compelled at the close to retrocede the portion of Bessarabia which it had acquired at the conclusion of the Crimean War, and to receive in exchange the Dobrudja. Early in the war the principality proclaimed its independence of Turkey, and its independence was recognized in the Treaty of Berlin, July 1878. As already stated, it became a kingdom in 1881, Prince Charles becoming king as Charles I. His wife was well known as a writer under the pseudonym Carmen Sylva. His nephew and heir, Prince Ferdinand, was married in 1893 to Princess Marie, daughter of the late Duke of Saxe-Coburg-Gotha.

The policy of modern Rumania was dominated by the German plan of expansion toward the East. King Charles, being a Hohenzollern, retained feelings of closest intimacy with the Austrian emperor, Franz Joseph. But as early as 1907 forces within Rumania had begun to turn her away from Austria and set her toward France. In that year a very serious outbreak had taken place among the peasants which resulted in much needed agrarian reforms. Moreover, disatisfaction had been growing with the governments at Vienna and Budapest. The Magyars had been more than ever annoying the Rumanians of Transylvania, and Austria was discriminating against Rumanian commerce. At the beginning of the Balkan War (1912) Rumania was an interested onlooker of the struggle which the other Balkan states were waging against Turkey, but she joined Serbia and Greece in the second Balkan War against Bulgaria. As a result Rumania got the Dobrudja region north and east of a line drawn from Turtukai to Baltchik. Fear of Bulgarian revenge caused Rumania, Serbia and Greece to draw more closely together, and Rumania was now recognized as the leading Balkan power according to the Treaty of Bucharest (10 Aug. 1913), On 10 Oct. 1914 King Charles died and was succeeded by the Crown Prince, Ferdinand. In the first year of the Great War Rumania had announced a policy of strict neutrality. Although she maintained her neutral attitude during the Teutonic drive into the Balkans (1915), she was drawn into the conflict the following year, only to collapse in the fall of 1916, upholding the claims of the Rumanians of Transylvania. After the outbreak of the Russian Revolution (15 March 1917) and the subsequent Brest-Litovsk Treaty (3 March 1918), Rumania was forced to come to terms with Germany. The only alternative left to the country if the conditions were refused was to submit to seizure by the Central Powers. Under the peace treaty (6 May 1918) Rumania was compelled to give back to Bulgaria that part of Dubruja which had passed to Rumania by the Treaty of Bucharest of 1913. The northern section of Dobrudja, which includes the mouth of the Danube and Rumania's only outlet to the Black Sea, was ceded to the Central Powers, to administer through a mixed commission. In addition wheat, salt and petroleum concessions were made to Germany; and Austria-Hungary profited by the «rectification» of the Transylvanian frontier, to the extent of gaining important mountain passes and valuable mineral lands. As for Bessarabia, Austria had declared, during negotiations, that Rumania would be compensated for loss of the Transylvanian boundary territory by taking the southern part of Bessarabia. This latter country, one of the richest farm lands of what was formerly Russia had been so badly ravaged by Bolshevik troops that the Rumanians had been called upon for help by the Bessarabians. As a result the whole of Bessarabia voted (9 April 1918) almost unanimously for union with Rumania. When the Great War was won by the Entente powers the position of Rumania was reversed. From a territory of 53,489 square miles she was extended to 122,282, by the addition of Bessarabia, Bukowina, Transylvania, the Banat, Crisana and Maramuresch as a result of the peace treaties of 1919.

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**RUMANIAN LANGUAGE.** The origin of the Rumanian language dates from the 2d century, when the Roman colonies settled themselves on the left bank of the lower Danube, By its grammar and vocabulary this language belongs to the group of the Romance languages, and it is spoken to-day by the vast majority of Rumans over the whole of Rumania, in Transylvania, Bessarabia, Bukovina and the Dobrudja.

Antonio Bonfinius (1427–1502), the learned Latin historian of the Renaissance, was the first to introduce scientific research of the origin of the Rumanians as a people. He enunciated the theory of their Roman descent, regarding them as descendants of the Dacian colonists of Trajan, who spoke a particular Latin dialect, *lingua rustica.* Bonfinius' contention was passed on from historian to historian until by the 19th century it had been credited in very wide circles. In the year 1812 a history of the Rumanians written by a Transylvanian priest, Peter Major, appeared and aided in establishing the belief in the direct Roman paternity. According to Major, Rumanian is the tongue of Rome transplanted from Italy to Transylvania. It was held that the nationality and language of the Eternal City continued to survive on Transylvanian soil even after the disappearance of Dacia as a colony. Other Rumanian writers, Cogalniceanu, Laurianu, Xenopol and Maniu, confirmed the theory of unbroken continuity (*continuitate neintrerupta*) between the Legions of Trajan and the present-day Rumanian peasantry. These historians grouped into a homogeneous mass the Dacian colonists and other tribes, and considered them as one until the invasion of the Hungarians annihilated their institutions and laws. Not only did the Rumanian historians maintain this view, but even European scholars such as Gibbon, Thierry, Mommsen and Ranke, also exploited these ideas. Over against this array of scientists there is another group of philologists who stood for a different conception of the origin and development of the Rumanian language. They assail the assertion of the unbroken continuity of the Rumanian language as exaggerated. The men who form this group are: Sulzer, Kopitar, Miklosich, Goos, Roesler, Paul Hunfalvy and Tomaschek. These skeptics base their position upon the evidence offered by the structure of the language and consider old Illyricum (the western part of the Balkan peninsula) as the cradle of the Rumanian language. They assume that Rumanian spread from the Adriatic to the northeast about the time of the Middle Ages, and that through reaching Slavic culture it became enriched and strengthened. It seems reasonable to suppose that the language which was founded by the early colonists was in form and content Roman and that on account of modification by the tongues of the early inhabitants of the colonized region, it gradually became the true Rumanian language. The Latinization of the Albanian tongue is due to the Roman occupation. And both of these, the Rumanian and the Albanian, possess no greater number of words from the Age of Augustus than do the Latin languages of the West, but they manifest the Roman elements in a somewhat more ancient form than do Italian and French. The guttural sounds are never, at least in the root, rendered into palatals or sibilants, while the sibilant *s* has often retained in Rumanian, as in Spanish, its original tone even when placed between two vowels: Rumanian, *cesar,* Latin, *cæsar;* Rumanian, *rosei* from *rod;* Latin, *rodo, rosi.* It is noteworthy that where Latin words have survived they are sometimes purer than in the Romance languages of the West; for instance, Latin *domina* is better represented by Rumanian *doamnă* (lady), than by Italian *donna,* Spanish-Portuguese, *dona* and French, *dame.* Some words such as *laudare,* to praise, *ducere,* to lead, *credere,* to believe, retain some forms unaltered under which they were used by Virgil and Cicero.

The Rumanian dialects have an article, just as Italian, *il uomo, i uomi,* but while in Italian it precedes the word, in Rumanian it is appended to the word, *omu-l, oameni-i,* a characteristic which Albanian shares. The article is the same but it is adapted to the spirit of the Rumanian and Albanian. Such is the case with certain numerical words. The numbers, 11, 12, etc., are expressed in Italian *undici, dodici* . . . , while the Rumanians employ an assisting word *spre* (supra); *un-spre-zeče, doi-spre-zeče, etc.* The same construction is found in the Albanian, *spre* corresponding to *mbe* in the latter (*niê-mbe-diêtê, dhi-mbe-di êtê*). Making ordinals with the help of articles is similar in Rumanian and Albanian; and the comparison of the adjective runs parallel in the two languages. Rumanian has no special infinitive, but it has to be constructed by a descriptive form (*to see,* will thus be expressed by the combination of *that I see*); the same holds true of Albanian. The lack of infinitives is sometimes to be noted in Serbo-Croatian: *Ja ću još jednu godinu da te služim* (V. Karadžić, Pripov. 51). But both forms are to be found in Rumanian as well as Serbian. The influence of Serbian and other South Slavic tongues upon Rumanian became more pronounced as Latin-Italian waned. When the Roman source evaporated, the impress of Slavic culture became marked. During the course of the 9th and 10th centuries Old Slavic was the church language of the Rumans. This explains how three-fifths of the words are Slavic, while only two-fifths are of Latin and other origin. The first archives, which mention the Rumans, date from 1210–30. Rumanian words are to be found in Slavic documents since 1436, the first being translations of pseudo-evangels (1550) and psalms (1577). During the 15th century the Rumans had welded themselves into a compact nation, according to the opinion of Bonfinius. The Church continued Slavic for a longer time, but after 1643 the Rumanian language was employed instead of Slavic for the use of the Orthodox Church. The written word in Rumanian appeared first in Transylvania, as the Latin alphabet came gradually to replace the Cyrillic. Rumanian orthography remained in a transitional state throughout the 19th century, retaining until to-day the Latin alphabet with some special diacritical signs to represent sounds borrowed mostly from the Slavic.

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**RUMANIAN LITERATURE.** To get a clear idea of Rumanian (or properly Daco-Rumanian) literature, it will be convenient to divide it into oral and written. The first of these sections includes the interesting *doĭne* (lyric songs), *balade* (epic songs), *hore* (dance songs), *colinde* (carols), *basme* (fairy tales), *snoave* (anecdotes), *vorbe* (proverbs) and *ghicitoare* (riddles). This literature belongs generally to the cycle of the Balkan nations as a whole, for in everyone of these countries exact parallels are to be found. There was no direct borrowing by one nation from the other, but all of them seem to have stood for a long time under identical psychological influences and to have developed on similar lines. Their folklore shows much family likeness. The heroes are often the same. The Serbs, Bulgars and Rumans sing the chivalrous deeds of their *hajduks* (braves), Starina (Baba) Novak and Kralyevich Marko; or they recite the legend of the Monastery of Argesh or the ballad of Iorgovan, found also in the Russian *byliny.* The Rumanian folk-songs are mostly heard amongst gatherings of peasants, men and women, who transmit them by oral tradition. They are in general unrhymed, rhythmical improvisions, sung to a monotonous chant, accompanied often with a *cobza* (guitar) or with *fluer* (flute), beginning and ending with a refrain. Most of the poems have the wild melancholy and the fierce simplicity of all true popular songs. The epic poetry is not so rich as that of the Serbian, but compares favorably with the Bulgarian. The noted and far-famed *doĭne* have an undertone of ghastly mystery that reminds one of the Highland «second-sight» and Irish fairy tales. They belong to a world of banshees and wraiths; there are bits and refrains that recall the *Pharmaceutria* of Theocritus. One striking fact in these poems is the absence of any suggestion of Christianity as a religion, of church, of creed, or ritual of any kind. If there are any religious ideas at all, they are Pantheistic, but with the Pantheism of oceanic islanders. This absence of Christian ideas suggests that the basis of the *doĭne* may belong to pre-Christian ages; and possibly, may have been colored and influenced by *tsigani* (gypsies) and *lăutari,* a kind of wandering minstrels, by whom they are chanted and recited.

For a long time the collection of Rumanian oral literature was neglected, and it began only in the middle of the 19th century. One of the first to collect these treasures of national literature was Vasile Alecsandri in 1852–66. Bringing together the fragments of the Rumanian Iliade, Alecsandri was not so strict as modern study of folklore demands; however, he retained their poetical beauty unerringly. In 1859 A. M. Marienescu collected the songs of Transylvania, S. F. Marian, those of the Bukovina (1873) and T. T. Burada, those of the Dobrudja (1880). But the most complete collections are those of S. F. Marian, *Poesii populare române, I. Balade, II. Doĭne si Hore* (1873) and G. D. Teodorescu, *Poesii populare române* (1885). The collection of fairy tales started later than that of the ballads. The most important, considered as classical, are the successive publications of P. Ispirescu. The collected tales of the Moldavian Ion Creanga (1837–89) appeared in his *Opere complecte*

(1908). Good collections are those of D. Stancescu, *Basme* (1885–93) and *Frăncu si Candrea* (1888). In the second half of the 19th century Rumanian folklore was published in the reviews of *Convorbiri literare,* and *Contemporanul.* In recent times the only review devoted to the study of folklore is the *Shazatoarea* founded in 1892.

Leaving the popular and oral literature, we come to what has been committed to writing. The earliest specimen of Daco-Rumanian monuments do not go back of the 16th century. All conserved documents prior to this period were written in old Slavonic, which was used by high officials and in church also. Unity of language did not exist at that time. In Moldavia they employed the Russo-Ruthenian dialect and in Wallachia Serbo-Bulgarian. The first and most prominent writer was the Metropolitan Grigorie Tamblacu (Slavic, Grigoriy Tsamblak) who wrote 26 works in three different dialects: Serbian, Bulgarian and Russian. In 1407 he was hegumen of the Serbian monastery Visoki Dechani, and in 1409 went to Russia. A few years later came to Moldavia where he settled and played a prominent rôle, introducing the Cyrillic alphabet and the Slavonic language in the service books of the Moldavian Church. From the 16th century began to appear books and manuscripts in the Cyrillic alphabet and in both vernaculars, Slavonic and Rumanian. The literature of this period consists mainly of translations from the Bible, homilies and chronicles. There is a gospel composed by Radu Gramaticu, 1574 (now in the British Museum); a printed book by a clergyman, Coresi Diaconul (1560–82); a collection of religious writings of the Priest Grigore din Mahaciu, from Transylvania; *Codex Sturdzanus;* and Codex Veronetean (*Codicele Veronetean*). All these documents have more historical and philological than literary value. They are clumsy translations from Slavic and Greek works.

In the 17th and 18th centuries Rumanian literature has more national features, but judging by its content it is the spontaneous continuation of the church literature of the 16th century. In this epoch were published prayer-books, psalms and sermons. Among the church authors of that time was the Wallachian metropolitan, Varlaam, who «hated idleness and loved work.» He founded in Bucharest a printing press and invited there men of experience who understood their business. The first book published in this printing-house was «The Key of Understanding» (*Cheaia intelesului,* Bucurest ani dom 1678) written by the rector of the Theological Academy of Kiev, and prefaced by Varlaam himself. Later on were published several books of the Metropolitan Dositheiu, of which the most significant is the *Vieţtile Sfinţilor* («Lives of the Saints,» 2 vols., Jassy 1683). To this kind of literature belongs the *Mântuirea păcătosilor,* or «Salvation of Sinners,» translated from the Greek by a certain Cozma in 1682, which may be regarded as a storehouse of mediæval exempla; and the «Mirror of Kings,» ascribed to Prince Neagoe Bassaraba, written originally in Slavonic and translated into Rumanian about 1650. Joan of Vinţi compiled *Sicriu de aur.* («The Golden Treasury,» Sasz-Shebesh 1688), from some Hungarian Calvinistic collections of obituary sermons. The brothers Radu and Şerban Greceanu translated *Mărgăritare* («The Pearls») an anthology made from the Greek homilies of Saint Chrysostom, Epiphanius, Anastasius and Sinaita.

Of greater interest in Rumanian literature are historical productions. They are short annals, written originally in Slavonic by monks in the monasteries of Moldavia and Wallachia. Some of these annals were written in the 16th century, but most of them have not been preserved. The annalists of the later period were usually the sons of the *boyars* from Moldavia, educated in Polish and Russian universities, such as Gregorie Ureche (1590–1646), who wrote ‹Dominii tarii Moldovei şi viata lor,› and his contemporary Miron Costin whose writings rank as classical. Costin's best works are ‹Cartea pentru descalecatul de'entiiu a tarii Moldovii,› and ‹Letopisetul tarii Moldovei,› including the events from 1594 to 1662. The son of the latter, Nicolae Costin (1660–1712), continued the work of his father, and Jon Neculce (1672–1743) wrote the history of Moldavia from 1662 to 1743, a history in which he was participant himself as an eye-witness. In Wallachia the earlier history was written by Radu Logofatul Greceanul (17th century) and Pitarul Hristache, who wrote, about the end of the 18th century, a chronicle in verses: ‹Istoria fartelor lui Mavroghene Voda.› A Russian historian, Nikolai Statariya, called in Rumania Nicolae Milescu, or the Rumanian Marco Polo, wrote interesting historical sketches describing his travelings in China, where he was Ambassador of Russia, and where he died in 1714. The Transylvanian author, George Şincai (1753–1816) founder of the Latinist school in Rumanian literature, spent several years in Rome and published a monumental work *Cronica Rominilor şi altor neamuri invecinate* (Jassy 1853). Magyar censors burned and forbade this work in Transylvania because of its patriotic tendency. Another Transylvanian, Petru Maior (1755–1821) wrote books on historical, ecclesiastical and linguistic subjects. Two of his most important works are *Istoria bisericei Rominilor,* and especially *Istoria pentru inceputul Rominilor.*

The beginning of the 19th century was an era of preparation. Two foreign influences manifested themselves, French and Greek, or rather Greek-Phanariote. The national language was ignored and Greek was regarded as classical. Into it were translated the lyric and dramatic poems. Among the higher aristocratic classes Greek and French were exclusively used, especially in the *boyar* families. Every writer of better standing was supposed to be familiar with these languages and their literatures. A third influence came to be added toward 1816–20, that of Transylvania, which brought an exalted and intolerant patriotism, born of contact with Hungary, and animated by the Rumanian cult and the hatred of Hellenism. The rôle of the Transylvanian agents consisted in founding schools and newspapers, while the practical sciences, philosophic conceptions and foreign literatures were subjected to vulgarization. The first men in Rumania who proved that scientific works could be written not only in Slavonic and Greek but in Rumanian as well, were George Lazar (died, 1823) and his disciple Ioan Eliade Radulescu (1802–72). They were followed by Budai-Deleanu, author of many historical and poetical works who wrote the famous comic epic, ‘*Tsiganiada.*’ Andrei Muresianu was celebrated for some of his patriotic poems and especially the ‘Desteapta-te, Romine’ («Arise, Rumans»), which became the national anthem of Rumania. Among the writers of this time was also D. Bolintineanu (1819–72) who made his mark with ‘The Dying Virgin,’ his ‘Legendele nationale’ and Florile Bosforului’ (‘Flowers of the Bosphorus’), which latter work described the beauties of Constantinople in very melodious language. He wrote tales which were excellently styled, but later on his art began to deteriorate, till the *Reveriile* signaled the decline of his inspiration. Grigorie Alecsandrescu (1812–85), another author of the time, wrote with less facility than Bolintineanu, but with more sincerity. His erotic lyrics are now out of fashion, as are all the lyrics of that day. But his patriotic odes have a grandeur that is remarkable, and his satires a great variety of attractions.

In the period 1860–80 was formed the influential literary society *Junimea* (Youth). Prior to the establishment of this society the art of writing had been carried on in rather an inconsequential manner, i.e., without restraint. Authors had had the liberty to write as they saw fit. There is no doubt that therein protruded a grave danger. It had the effect of organizing factional or separatistic schools, as the Transylvanian, the Wallachian and the Moldavian. At the head of the conflicting forces stood Titu Maiorescu (1839–1917) as the *spiritus rector* of the *Junimea* (Jassy, Moldavia), and B. P. Hasdeu (Bucharest, Wallachia). B. J. Hasdeu (1838–1907), a poet, philosopher, historian and critic, was the editor of *Columna lui Traian.* He was aided by V. Urechia, a prolific writer and able historian, who was editor of *Revista Contemporana.*

In the field of pure literature during the second half of the 19th century were distinguished Al. Macedonski, poet and editor of *Literatorul;* Matilde Cugler Poni (b. 1853); Veronica Micle (1853–89); T. Serbanescu (b. 1839); A. Sihleanu (1834–57) and especially Mihail Eminescu (1849–89). The latter had a determining effect upon Rumanian literature, and knew how to express the most profound thoughts in a form which gave new life to the Rumanian language. The period in which Eminescu wrote and lived was characterized by the multiplicity of the sources of inspiration and the diversity of the kinds and groups of writers. Personal independence and perfection of form were features of the time, in which strove the conflicting forces of romanticism and popular literature on one side, and modern European literature on the other. C. Dobrogeanu Gherea (b. 1853) showed himself to be a man of great talent who understood the various literary tendencies and foreign influences in his country. He is the critic who gave in theory the correct formula for the reconciliation of the form and the matter, and, in practice, the independence of the personal inspiration of the artist from the milieu. The ideas of Gherea were best represented and explained by J. Nădejde and V. G. Morzum, directors of the *Contemporanul* in Jassy.

However, the most notable name of this era was that of George Coşbuc (b. 1866), a poet endowed with deep human feeling, with energy and a great love of nature. He spread respect for national tradition which he fused with the most audacious innovations, profoundly Rumanian. He was without equal, a man of enormous activity and facility in composition and suppleness of style. There could also be mentioned between Eminescu and Coşbuc, Nicolae Volenti, Nicolae Beldiceanu (1844–96), and Alecsander Vlahuţa (b. 1858). The latter aided in establishing Eminescu's reputation, but the Transylvanian, Coşbuc, almost outshone Eminescu with his poems which were more thoroughly based upon the national ballads of the country. At present the two Transylvanians, Stefan Josif (d. 1913) and Octavian Goga, founder of the review *Luceafărul* («The Morning Star») and, in Rumania proper, Alecsander Stavoi and H. Lecca, wrote in Coşbuc's way. Josif shows resemblances to Verlaine, and this new style has made that writer the bright young star in the firmament of Rumanian poesy. Hélène Vacaresco and the Countess Mathieu de Noailles, as well as other members of the Rumanian nobility, write in French.

In fiction appear the names of Joan Ereanga (1837–89), Jacov Negruzzi (b. 1842), whose father Constantin Negruzzi (1806–66) was the well-known translator of Pushkin and Victor Hugo, and Joan Slavici (b. 1848), the lyrical story-writer. Other recognized authors of fiction are Duiliu Zamfirescu (b. 1857) with his romance «Country Life,» Al. Vlahuţa with his social novels which treat of modern Russia, Nicolae Ganea (b. 1840) who translated Dante, and Barbu Stefanescu (b. 1859) whose works, inspired by modern French literature, were published under the pseudonym of Delvrancea. A. Odobescu created the Rumanian historical novel by his ‘Mihnea Voda’ (1858) and ‘Doemna Kiajna’ (1860). The modern short story was cultivated in Transylvania by Slavici, Jon Russu-Şirianul, Constantin Sandu and Mihail Sadoveanu. Occasionally Sadoveanu and Joan Ciocarlan revived the setting of old Rumania in their stories of the past. In general the writing of romances, just as among the South Slavs and Neo-Greeks, was given little attention. Authors as well as a public were equally absent. The pathological romance of Constantin Mille entitled ‘Dinu Milian’ (1880) was a result of the socialist wave; Vlahuţa wrote a romance concerning the woes of an idealist entitled ‘Dan’; and Sofia Nădejde and George Adam tried the experiment of divorce stories.

The drama received but meagre treatment. The light pieces on contemporary life written by Alecsandri and Joan Luca Carageale (1853–1902), the Gogol of Rumanian literature, found their opposites in the heavier and more earnest plays of H. Lucca and R. Rosetti, which partook of French themes. Historical dramatic writings, which in the 70's and 80's appeared in great number, again entirely disappeared in the decades following. The modern Rumanian stage was supplied principally from France, just as that country also monopolized the theatre of the other Balkan nations.

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**RUMBOLD**, rŭm'bōld, Sir **Horace**, 8th Baronet, English diplomat: b. 2 July 1829; d. 3 Nov. 1913. He entered the diplomatic service in 1849 and was attaché at Turin, Paris, Stuttgart, Vienna and Ragusa successively. He was secretary of the legation in China in 1859, and was transferred to Athens in 1862. In 1868–71 he was secretary of the embassy at Petrograd, and in 1871–72 he was at Constantinople in that capacity. He was appointed Minister to Chili in 1872; was Envoy Extraordinary to Argentina in 1879–81, to Sweden and Norway in 1881–84, to Greece in 1884–88, and to the Netherlands in 1888–96. In 1896–1900 he was Ambassador to Austria. Author of ‹The Great Silver River›; ‹Recollections of a Diplomatist› (1902); ‹Further Recollections› (1903); ‹Final Recollections› (1905), etc.

**RUMELI HISSAR**, the «Citadel of Europe,» a village six and one-half miles northeast by north of Constantinople, of which it forms a suburb. The Castle was built in 1452 by Muhammad II out of materials from Christian churches and other buildings demolished for that purpose, and by the forced labor of Greeks, 2,000 of whom were employed as masons and lime-burners alone. The sultan himself supervised the building of the walls. The Greek emperor sent ambassadors to protest against the fortress as an infringement of treaties, to which the sultan replied that the next envoy sent him on a similar errand would be flayed alive. The citadel enabled him to command the straits and to exact toll from all passing vessels. A particular feature of the fortress is that the plan of its walls represents four gigantic Arabic letters — those which form the name Muhammad, MHMD.

The Castle served as a prison for Christian captives after the capture of Constantinople; among the first incarcerated were Knights of Malta. Nearby is the spot where Darius and his army crossed to Europe over the pontoon bridge constructed by the Samian Mandrocles. Here also the Goths and crusaders crossed into Asia.

**RUMELIA**, roo-mē'lĭ-ạ, Eastern Bulgaria, a province established, with administrative autonomy, by the treaty of Berlin, 1878, known also as southern Bulgaria. It was formerly part of Turkey in Europe. It is bounded on the north by the Balkan Mountains, on the east by the Black Sea, on the south by a line beginning at Cape Seityn about lat. 42° 20′ N., and proceeding west-southwest to the Rhodope Mountains, and on the west by the watershed between the Maritza and the Karasu. Originally it was arranged that the province was to be under the direct political and military authority of the sultan, but to be administered by a Christian governor-general appointed for five years by the Porte, subject to the approval of the European powers. This arrangement continued for a few years, but in 1885 the government was overturned by a popular movement and a union with Bulgaria effected, in which the Porte acquiesced. The capital is Philippopolis. The area is 13,700 square miles. Pop. about 1,200,000. See Bulgaria.

**RUMFORD, Benjamin Thompson,** Count. See Thompson, Benjamin, Count Rumford.

**RUMFORD**, Me., town of Oxford County, on the Androscoggin river and on the Maine Central Railroad, 57 miles north of Lewiston. Rumford Falls, «New England's Niagara,» has been utilized for one of the greatest power plants in the East, including a hydroelectric station completed 1918, developing a capacity of 30,000 horse power. At the headwaters of the Androscoggin River seasonal storage is afforded by a system of six lakes, the Rangeley chain, for which it forms the outlet. Each of these has been improved by regulating dams, raising the natural level four feet in one case, 12 feet in another, 20 feet in three of them and 45 feet in one, creating an available storage capacity of 30,000,000,000 cubic feet, with a surface area of 125 square miles. At Rumford a series of three rapids cover a distance of one mile with a total drop of 180 feet. The fall over the first group is 100 feet and is that developed in the hydroelectric plant. It is obtained with the aid of a dam 40 feet high at the head of the rapids, a solid concrete structure 250 feet long. The fall of the second group of rapids is 50 feet. The remaining 35-foot drop is developed mechanically in the mill of a paper company, which, in addition, buys electrical energy from the Rumford Falls Power Company. The smaller rapids are developed by a system of canals, one flowing into the other. In conjunction with the dam at the first group of rapids there is a canal 100 feet wide and 15 feet deep, blasted out of the solid ledge, which carries the water to a gatehouse, thence through tunnels, bored 16 feet in diameter through solid rock and lined with concrete, to the water wheels in the power station on the bank of the river.

The chief industries are paper, paper bags and supplemental chemical works. Since 1900 a notable undertaking has been the building of commodious houses that could be rented at reasonable rates to workers in the several industries; a mechanics' institute and a Carnegie library are the prominent municipal institutions. Pollucite, a geological rarity, occurs with beryl in pegmatite veins in the rocks at Rumford. Pop. (1920) 7,016.

**RUMINANTS**, herbivorous split-hoofed animals, characterized especially by chewing the cud; they include the camels and llamas, giraffes, deer, pronghorns, antelopes, sheep, goats and ox-tribe and thus nearly all the mammals most economically important to man. All these, except the camels and giraffes, are represented on the continent of North America, and two — the pronghorns and musk ox — are peculiar to it. In most, no incisor or canine teeth exist in the upper jaw, the place of these being supplied by a hardened or callous pad of gum, against which the lower incisors bite. Six incisors exist in the lower jaw. Canines are always present there, and are usually inclined forward and toward the incisiors, which they nearly resemble in form. The general number of lower canine teeth is two. The molar and premolar teeth number six on each side of each jaw and are selenodont, that is possess flattened crowns topped by two double folds of enamel of an irregular crescentic shape. The stomach is divided into four compartments. (See DIGESTION). In feeding, the herbage is rapidly cropped off by the lower incisors pressing against the hardened gum of the upper jaw. The food mixed with saliva is swallowed into the paunch, where it is simply moistened and then passes into the reticulum or second compartment. The aperture of the gullet now closes, and the mass of food contained therein is propelled upward into the mouth by a muscular action similar to that of vomiting. Mastication of the food is then effected by a kind of rotary motion, the lower jaw thus giving a first stroke, for example, from left to right, and the rotary motion continuing persistently afterward from right to left, or in the opposite direction to the first movement of the jaws. This is «chewing the cud.» In the camels the motion of the jaws is said to be simply one from side to side. After it has been thus thoroughly masticated and remixed with saliva, the food is again swallowed, and passes on at once into the third stomach and is assimilated.

Two distinct divisions of the ruminants may be recognized according to the nature of the horns, and are known respectively as the «solid-horned» and the «hollow-horned.»

The first section includes the giraffe (although no external antlers arise), the deer and pronghorns; and the other the antelopes and the sheep, goat and ox tribes. The antlers of deer consist of nearly homogeneous bony tissue, lighter and more porous in structure than ordinary bone; they are generally much branched or forked, and are shed and renewed every year. (See ANTLERS; DEER).

The horns of the hollow-horned ruminants are entirely different from the antlers of deer, in structure as well as in manner of growth. They are usually common to both sexes, as in our domestic cattle, are simple and not branched and grow continuously throughout the life of the animal, though very slowly after it has reached maturity, and are never shed. They consist of a bony core — an elongated process from the frontal bone — covered with a sheath of horn. (See HORN).

Technically speaking, the ruminant game animals of North America consist of three distinct families, two of which are represented by several genera, and some of the genera by numerous species. These families are the pronghorns (*Antilocapridæ*); the deer (*Cervidæ*); and the sheep, goat and ox tribes (*Bovidæ*). They are all «game animals,» and some of them are rapidly approaching extermination. The pronghorn, though usually called the American antelope, is not a true antelope, but is of a distinct family type, found only in North America, and peculiar in the fact that its horns are branched, and shed annually. (See PRONGHORN). The deer tribe in America consists of five genera, namely, the wapiti (*Cervus*); the small deer of the United States and Mexico (*Dama,* or *Odocoileus*); a Central American brocket (*Mazama*); the moose (*Alces*), and the caribou (*Rangifer*). These are separately described under their names. Altogether between 25 and 30 species of deer exist in North America, including Mexico. Of the ox and sheep tribes or horned ruminants, the most prominent native member is the almost extinct bison (q.v.). The mountain sheep (see BIG-HORN) number five species, and the Rocky Mountain goat (q.v.) number two species; but of most of these species so few examples are known and their range is so limited that it may well be doubted whether they will ultimately be regarded as distinct. The goats and sheep are mountain dwellers, their favorite haunts are the more inaccessible parts of the higher ranges and they are exceedingly watchful and sagacious. They have been exterminated in the more accessible parts of their ranges and survive in comparatively small numbers and greatly restricted areas. The musk-oxen, or musk-sheep, are a very distinct type, entitled to a distinctive name free from the implication of such alliance; but the term musk-ox (q.v.) is not likely soon to be displaced. There are two species, the barren-ground and the Greenland.

The ancestors of the higher ruminants are mainly of Old World origin, and are comparatively scarce and late in appearance in the fossil beds of our own continent. The oldest forms definitely known were those of the family *Anthracotheriidæ,* pig-like animals, with teeth approaching the selenodont shape and a complete dentition; all the bones of the five-toed feet were free. The type-genus *Anthracotherium* (q.v.) begins in the Oligocene and continues down to the Pliocene, and is known from all parts of the world. Another early group was more sheep-like in its characteristics and forms, the family *Cænotheriidæ,* represented by *Cænotherium,* which flourished in the Eocene and Miocene eras. They were small-sized, more delicate than modern sheep, the dentition was complete and four toes reached the ground. Another large group was the family *Oreodontidæ,* which was limited to North America, and whose remains have been found plentifully and usually in excellent condition in the Tertiary rocks of the eastern Rocky Mountain region. The oreodonts were ancestors of deer and antelopes and some were horned, while all had five functional toes in front and four behind. Prominent genera are *Oredon,* of the size of a small pig; *Mesoreodon,* larger and stouter; *Casoryx, Agriochærus* and most primitive of all *Protoreodon.* Another primitive family wholly European was *Anoplotheriidæ,* represented by the long-known *Anoplotherium.*

**RUMP PARLIAMENT,** in English history a name by which the remnant of the Long Parliament was known after the expulsion of the majority of its members by the army of Cromwell, 6 Dec. 1648, until the latter's reconvention after Cromwell's death. It having been decided by a majority of the House of Commons that the concessions made to Charles I in the Treaty of Newport were a ground of settlement, Oliver Cromwell, who wished for the condemnation of the king, despatched two regiments under the command of Colonel Pride to coerce the House. In discharge of the resolution of the army that «none might be permitted to pass into the House but such as continued faithful to the public interests,» Colonel Pride, whose regiment was stationed so as to block all the entrances to the House of Commons, furnished himself with a list of the names of the members against whom the sentence of exclusion was passed, and as each approached prohibited him from entering. Forty-one members were placed under temporary restraint and 160 ordered to their homes. Only 60 were admitted, all violent Independents, and these constituted the «rump» after the clearance wrought by «Pride's Purge,» as it is called. This assembly, in conjunction with the army, brought about the arraignment, trial and condemnation of Charles I. It was forcibly dissolved by Cromwell, 20 April 1653, for presuming to make a stand against certain demands of the army. Twice after this it was reinstated, but both times only for a brief period. In the latter instance, 21 Feb. 1660, the expelled members were restored, it was again known as the Long Parliament and on 16 March 1660, solemnly decreed its own dissolution.

**RUMSEY,** rŭm'sĭ, **James,** American inventor: b. Bohemia Manor, Cecil County, Md., 1743; d. London, England, 23 Dec. 1792. He was a mechanical engineer, and while engaged as the superintendent of a mill in Shepherdstown, Va., conceived plans for the application of steam to marine propulsion. In 1786, 21 years before Fulton constructed the *Clermont,* he exhibited a boat upon the Potomac which was propelled by means of a steam pump which forced a stream of water from the stern. The Rumsey Society, in which Benjamin Franklin was greatly interested, was established in Philadelphia in 1788, and later an organization of the same name in England, to further his invention, but he died while his experiments were incomplete. He wrote ‹A Short Treatise on the Application of Steam› (1788).

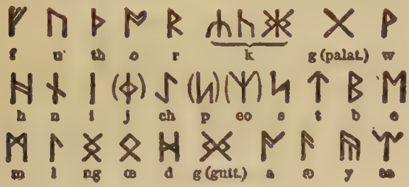
**RUMSEY, William,** American jurist: b. Bath, Steuben County, N. Y., 18 Oct. 1841; d. New York, 16 Jan. 1903. He was educated at Williams College, volunteered for the Union army in April 1861 and was granted his diploma from the college in June. He served through the war, attaining the rank of captain of volunteers in 1863, major in 1864 and brevet lieutenant-colonel in 1865, in which year he was mustered out of service. He was secretary of the United States legation in Japan in 1865–66, and in 1880–1901 served as judge in the seventh judicial district of the Supreme Court. He then resigned and engaged in law practice until his death.

**RUNCIMAN,** rŭn'sĭ-man, **Alexander,** Scottish painter: b. Edinburgh, 1736; d. there, 21 Oct. 1785. He was placed at 14 with some housepainters, who used to adorn the mantelpieces of the houses which they painted with landscapes, of which many a specimen is still preserved in the houses of the Old Town of Edinburgh. He devoted himself entirely to this art, and acquired considerable local fame for his landscapes. In 1766 he visited Italy, where he met Fuseli, whose enthusiastic character matched aptly with his own. He spent five years in Rome, assiduously studying and copying the Italian masters, and in 1771 returned with powers increased and taste improved. Just at that time he obtained the mastership of the Trustees' Academy, and his subsistence thus secured, he applied his leisure to historical painting. Among his best-known productions may be mentioned ‹Macbeth and Banquo,› in a landscape; a ‹Friar,› in a landscape; ‹Job in Distress›; ‹Samson Strangling the Lion›; ‹Figure of Hope›; ‹Saint Margaret Landing in Scotland›; ‹Christ and the Woman of Samaria›; ‹Agrippina Landing with the Ashes of Germanicus,› and the paintings in Ossian's Hall at Penicuik. The work last mentioned was his *chef-d'œuvre.* He was remarkable for candor and simplicity of manners and possessed a talent for conversation. Among his associates were Robertson, Hume, Lord Kames and Lord Monboddo.

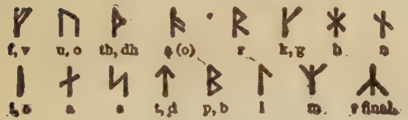
**RUNCIMAN, Walter,** English politician: b. South Shields, 19 Nov. 1870. He was educated at Trinity College, Cambridge, and for a time was connected with shipping interests. He was elected to Parliament in 1899; was Parliamentary secretary to the local government board in 1905–07; financial secretary to the treasury in 1907–08; served as president of the board of education in 1908–11, and of the board of agriculture in 1911–14. In 1912–14 he was commissioner of the King's Woods, Forests and Land Revenues, and he was president of the board of trade in 1914–16. He became a privy councilor in 1908.

**RUNEBERG, Johan Ludvig,** yō'hän lood'-vĭg roo'nĕ-bĕrg, Swedish poet: b. Jacobstad, Finland, 5 Feb. 1804; d. Borgå, 6 May 1877. He was educated at Wasa and at the University of Åbo. His first volume (1830) contained a number of lyrics and a long poem, ‹Nights of Jealousy.› In 1832 appeared an epic written in hexameters ‹Elgskyttarne› (the Elk Hunters); in 1833 a second volume of lyrics, and in 1836 the idyl ‹Itanna.› In 1837 he taught Latin literature at the university, became lector at the gymnasium of Borgå, where he remained until his death, being advanced to professor in 1844 and rector in 1847. His other works were the idyl ‹Julqvällen› (Christmas Eve) and the epic ‹Na donchda› (1841); ‹Lyrics› (1843); a romantic cycle, ‹Kung Fjalar› (King Fjalar, 1844); narrative poems, ‹FänrikStåls Sägner› (Ensign Stål's Tales, 1848–60); a rhymed comedy ‹Kan ej› (Can't 1862); ‹Kungarne på Salamis› (The King at Salamis 1863). His collected works were published in 1876 and posthumous works in 1878–79. See ENSIGN STÅL'S TALES.

**RUNES,** the characters used in writing by the Teutonic tribes of northwestern Europe in early times. Three classes of runes are recognized, Anglo-Saxon, German and Scandinavian, but the differences of form which distinguished them are no wider than the differences between the alphabets employed in very ancient times by various Greek peoples — between the Old Athenian alphabet, for example, and the Old Corinthian, or between the earliest Phœnician and the earliest Hebrew. The name Rune is significant of the use to which this manner of writing was first applied. In Anglo-Saxon *rûn* means secret, and *runa* magician; and the knowledge of runes was confined to a small class — priests or sorcerers. For this reason, upon the introduction of the Christian religion the use of the runes was condemned as connected with heathenish superstitions. A poet of the 6th century, Venantius Fortunatus, tells of runes being written on tablets or slabs of ash (*fraxineis tabellis*), but there are extant numerous runes inscribed on memorial stones, personal ornaments, rings, coins, etc., which have been found in Denmark, Norway, Sweden, Germany and Iceland, and in Britain within the limits of the ancient kingdoms of Northumbria, Mercia and East Anglia. Some examples of runes have been found in Ireland, France and Rumania. The best British examples are found on a cross in Ruthwell, Dumfriesshire, Scotland, on a pillar in Bancastle in Cumberland, and on the Frank's casket in the British Museum. The system of characters called runes gets the name Futhorc from the first six letters, just as the Greek system is called Alphabet from the names of the first two letters, alpha and beta, A and B, or as we call our alphabet the A B C. The following examples show the agreements and differences between British and Norse runes:



Anglo-Saxon Runes.



Norse Runes.

The origin of the runes is still a matter of uncertainty. While they are obviously an offshoot of the Helleno-Italic family of alphabets, it is not easy to ascertain at what point they branched out from their ancestral stock. While they have usually been regarded as of a purely Latin origin, the alternative theories have been propounded that they were invented upon a Galatian base, by the the Goths soon after their expedition to Asia Minor in 267, and that they are of Eubœan origin, through the contact of the Goths with Greek colonies in the Crimea. All these theories depend on a dating of the runes which is itself dependent on that of the Gothic bible of Ulfilas, in which an alphabet is used containing at least two runic characters. The authenticity of the 4th century date usually assigned to Ulfilas and his bible has been called into question by the investigations of Prof. Leo Wiener of Harvard University, and accordingly he is able to use for the derivation of the runes Greek alphabets much later than those which were formerly accessible for this purpose. He finds the prototype of the runes in the Greek cursive. He has also explained the order of the runes through their relation to the so-called ogams (q.v.) or tree-runes.

Except in Scandinavia, the runes were always a purely inscriptional alphabet. Scandinavian runic manuscripts exist, but are not older than the 13th century. The Latin alphabet gradually supplanted the runes, though they lingered on in popular use and in calendars until modern times. In England runes are found between the middle of the 6th and the midddle of the 10th centuries. Some Celtic runic inscriptions also exist. Consult Olsen, ‹Runerne i den oldislandske Literatur› (Christiania 1891); Stephens, G., ‹The Old-Northern Runic Monuments of Scandinavia and England› Copenhagen 1879); Taylor, T., ‹Greeks and Goths: a Study on the Runes› (London 1879); Wimmer, F. A., ‹Die Runenschrift› (Berlin 1887).

**RUNIC CHARACTERS.** See RUNES.

**RUNJEET SINGH,** rŭn-jēt' sĭngh. See RANJIT SINGH.

**RUNKLE, Bertha Brooks** (MRS. LOUIS H. BASH), American novelist: b. Berkeley Heights, N. J. She was educated privately and was married to Colonel Bash, United States Army, 26 Oct. 1904. Author of ‹The Helmet of Navarre› (1901); ‹The Truth about Tolna› (1906); ‹The Scarlet Rider› (1913); ‹Straight Down the Crooked Lane› (1915), etc.

**RUNKLE,** rŭn'kl, **John Daniel,** American mathematician: b. Root, N. Y., 11 Oct. 1822; d. Southwest Harbor, Me., 8 July 1902. He was graduated from the Lawrence Scientific School at Harvard in 1851, and having been appointed to the staff of the *American Ephemeris and Nautical Almanac* in 1849, continued with it until 1884. He was one of the promoters of the Massachusetts Institute of Technology and held the chair of mathematics there from the time of its foundation until his retirement shortly before his death, with the exception of 1870–78 when he was president. He established the *Mathematical Monthly* in 1859 and edited it until 1861, and published ‹New Tables for Determining the Values of the Coefficients in the Perturbative Function of Planetary Motion› (1856); ‹Elements of Plane and Solid Geometry› (1888), etc.

**RUNNING RECORDS.** See SPORTS.

**RUNNYMEDE,** rŭn'ĭ-mēd, England. Five miles east of Windsor, in Surrey, lying along the right bank of the Thames, is the celebrated meadow where the conference was held, 15 June 1215, between John and the English barons, in which the former was compelled to sign Magna Charta and the Charta de Foresta. (See JOHN). Runnymede is now divided into several enclosures.

**RUNYON, Theodore,** American diplomat: b. Somerville, N. J., 25 Oct. 1822; d. Berlin, Germany, 27 Jan. 1896. He was graduated from Yale in 1842, admitted to the bar in 1846, and established a law practice at Newark, N. J. He became city attorney of Newark in 1853, city counselor in 1856 and at the outbreak of the Civil War went to the front as brigadier-general in command of the 1st brigade of New Jersey Volunteers. He arrived at Washington on 6 May, when the threatened invasion by the Confederates had thrown the city into great alarm, and promptly took efficient measures for its defense. After the defeat of the Union army at the first battle of Bull Run when the city was in danger of invasion, he closed all approaches, stationed cannon to avert the expected attack and thereby saved the National capital, a service for which he received the personal thanks of President Lincoln and his Cabinet. He was honorably mustered out of service in July 1861 and resumed his law practice. In 1863 he was elected mayor of Newark, served as chancellor of New Jersey in 1873–87, and in 1893 was appointed Minister to Germany. He was raised to the rank of Ambassador in that year and remained in office until his death.

**RUPEE,** roo-pē′, in India, the name given a small silver coin. The value of this coin is nominally 50 cents, but owing to the depreciation of silver it has of late years varied between 30 and 40 cents. A rupee equals 16 annas; one-half, one-fourth and one-eighth rupee are also coined in silver. A *lac of rupees* is 100,000, and a *crore* 10,000,000 rupees.

**RUPERT, or ROBERT, of Bavaria,** PRINCE: b. Prague, 18 Dec. 1619; d. London, 29 Nov. 1682. He was the son of Frederick V, elector palatine and titular king of Bohemia, by the Princess Elizabeth of England, daughter of James I; was educated at Leyden and early engaged in military service in the Thirty Years' War. During the Civil War in England he had the command of a corps of cavalry, at the head of which he distinguished himself at the battle of Edgehill in 1642, at Chalgrove Field in 1643, and also at Marston Moor and at Naseby; but his impetuosity and imprudence contributed to the disastrous result of these latter engagements. In 1648 he was made commander of that part of the fleet which still adhered to Charles. Prince Rupert for some time carried on a predatory warfare against the English; but in an engagement with Blake, off the Spanish coast, he was worsted, and his whole squadron destroyed, with the exception of four or five ships, with which he escaped to the West Indies, where he supported himself by capturing English and Spanish merchantmen. Later he joined Charles II at the court of Versailles, where his time was chiefly devoted to scientific studies till the Restoration, when he returned to England. In 1664 he was appointed with Monk, to the command of a fleet against the Dutch, and in the next war with Holland, in 1673 was made admiral of the fleet. Many useful inventions resulted from his studies, among which are the invention of prince's metal, and although the discovery of the method of engraving in mezzotinto is not due to him, as was erroneously supposed, he introduced the art into England. He also introduced the curious glass drops that have been named after him, Prince Rupert's drops. He was likewise one of the founders and the first governor of the Hudson's Bay Company, incorporated in 1670, and a founder of the Royal Society. Rupert's Land (q.v.) was named after him.

**RUPERT** (RUPPRECHT MARIA LUITPOLD FERDINAND), Crown Prince of Bavaria, son of Louis III: b. Munich, 1869. He was educated at the University of Munich and at the Kriegsakademie. He entered the army, attained rank as lieutenant-general in 1903, and in 1913–14 he was inspector-general of the army. In the European War he commanded the Bavarian Army on the western front. His heir, Prince Leopold, was born in 1901.

**RUPERT'S LAND,** the former name of an extensive territory in Canada, conferred by Charles I on Prince Rupert, transferred to the Hudson's Bay Company in 1670, and since 1870 included with the other parts of the Hudson Bay Territories in the Northwest Territories. The title is still retained to distinguish an Episcopalian diocese; the see of the bishop of Rupert's Land is at Winnipeg. See NORTHWEST TERRITORIES.

**RUPIA,** a skin disease, characterized by an eruption of small flattened and distinct bullæ surrounded by inflamed areolæ, containing a serous, purulent, sanious or dark bloody fluid, and followed by thick, dark-colored scabs over unhealthy ulcers. Three varieties of this disease are described, *Rupia simplex, Rupia prominens,* and *Rupia escharotica. Rupia simplex* commonly appears on the legs, sometimes on the loins or thighs, and seldom on other parts. The bullæ are not preceded by any inflammatory symptoms, vary from one-half inch to one inch in diameter, and contain at first a transparent serous fluid, which soon becomes turbid and purulent, and dries into scabs. The scabs are easily removed, displaying an ulcerated surface underneath, and several series of these scabs may follow before healing sets in. In *Rupia prominens* the bullæ are larger, the scabs thicker and the ulceration deeper. The scab adheres firmly, and generally requires emollient applications to facilitate its removal. *Rupia escharotica* occurs chiefly in cachectic children and infants. It is commonly confined to the lower extremities, and begins by one or two red and livid spots, over which the cuticle is soon raised by the effusion underneath it of a serous fluid. The bullæ thus formed increase; the serum they contain becomes turbid, and of a blackish hue. A bloody and offensive sanies marks the surface of the sore, the edges of which are livid, but not very painful. Rupia is chronic, not dangerous, not contagious, but often very obstinate. It generally attacks persons debilitated by age, intemperance, bad living or previous diseases, especially smallpox, scarlet-fever and syphilis. The general treatment consists mainly in the administration of tonic decoctions, more especially those of cinchona, cascarilla, gentian, etc., with alkalies, a generous and nutritious diet and warm salt water and alkaline baths. The local treatment consists chiefly of puncturing the bullæ early, and allowing the morbid secretion to escape; of poulticing in order to remove the scabs, and of applying lotions containing nitrate of silver or nitric acid, or any other slightly stimulating application.

**RUPP,** rụp, **Julius Augustus Leopold,** German Protestant theologian: b. Königsberg, 13 Aug. 1809; d. there, 11 July 1884. He was educated at Königsberg and was connected with the faculty there from 1830 until 1851, when his religious teachings cost the loss of his position. He was at one time a preacher at the Royal Chapel but was deprived of his benefice because of his broad religious views. Upon his failing to receive royal confirmation after his election as pastor of the German Reformed Church at Königsberg, he in 1846 founded a «free congregation» at Königsberg and was one of the leaders in that movement. Author of ‹Der Symbolzwang und die protestantische Gewissensund Lehrfreiheit› (1843); ‹Literarischen Nachlass› (1891–1902), etc.

**RUPTURE,** hernia (q.v.), especially abdominal hernia, to which the term rupture is most frequently applied in popular usage.

**RURAL CREDITS.** See LAND CREDIT; FEDERAL FARM LOAN ACT; also BANKS AND BANKING.

**RURAL DEPOPULATION.** See FARM and FARM PROBLEMS.

**RURAL LIBRARIES** of the present are largely an outgrowth of the general library movement in the United States for the past 40 years. Nevertheless, many of these libraries are due to earlier educational movements. The desire for self-education which has characterized the United States ever since the colonial period stimulated the growth of societies devoted, like Franklin's Junta, to the improvement of their members. These spread to the small towns throughout the original colonies. The isolation of these small communities, due to wretched transportation facilities, made these societies play a large part in the community life. Libraries were a recognized part of the activities of many of these societies. Even when the society dissolved, the library often persisted to become either the predecessor or the direct ancestor of a modern public library. Many of the libraries of New England, New York and the Atlantic seaboard originated in this way. The lyceum movement, which was influential throughout the North and West from about 1830 till after the Civil War, through its lecture courses and public discussions caused the formation of many society libraries. Even the villages, too small to maintain lecture courses, had their local «literary» or «debating societies.» Many of these maintained small libraries for their members. School libraries became fairly common. Many of these like the «school district libraries» of New York State (authorized by law in 1834) served as rural community libraries also. Sunday-schools became very common everywhere. A small library was considered an essential part of nearly all of these, whether urban, village or in isolated church or schoolhouse. These libraries served an excellent purpose in familiarizing the rural sections with the library idea even though their books were usually confined to the mediocre or evangelistic types.

Massachusetts in 1890 established a library commission which took for its purpose the founding of a free public library in every town in the State. Other library commissions were founded. In every case the founding and maintenance of rural libraries was one of their chief duties. Through the traveling libraries maintained by these commissions the number of rural libraries was greatly increased and the number and quality of their books and periodicals materially improved. The commissions have also done excellent work in attempting to put the small rural libraries in touch with larger libraries and other library activities of their respective States.

Coincident with the rise of library commissions, the University Extension movement, which was imported from England in 1887 and flourished in the United States for more than a decade afterward, promoted the formation of «extension centres» and study clubs. The need of library facilities for the use of these groups soon became apparent and, in many cases, led to the formation of rural libraries free for the use of the entire community. Later educational reading circles and other extension movements of universities or State departments of education, have done much to show the need of rural libraries. Rural community centres also usually have a small library as part of their equipment.

Rural libraries, like rural schools, are probably only at the beginning of their adequate development. In many cases they will, in all probability, be merged with the rural school library. In the larger villages the rural library will probably be independent of the school library, though co-operating with it in every practicable way. Virtually all the State library commissions, many of the State departments of education and the Federal Bureau of Education are increasing their efforts to obtain good library facilities for all residents of the State, whether in the city, the town, the remote hamlet or the isolated farmhouse. The rural school has been made possible only through State supervision and State support. It seems probable that the rural library as well is destined to receive a greater share of State support than it now gets. Closer organization of rural library interests has been begun in some places through district libraries which act as reference and distributing centres for the small libraries of their districts. In many States the county has been adopted as the district unit. The first of these county libraries was the Brumback Library of Van Wert, Ohio, which became the library centre for Van Wert County in 1894. The best-known State system of county libraries is that of California.

Many rural libraries depend almost entirely on voluntary «library associations» or educational and social clubs for their support. In an increasing number of cases the library is aided by the tax funds obtained from State and local sources. The rural libraries entirely supported by funds raised by public taxation are as yet in the minority. This, however, is the only logical means by which library facilities can be supplied adequately to rural districts and State support of libraries must increase with a growing interest in rural education. Trolley lines, better roads and the automobile have made it easier for the smaller towns and villages to act as library centres for the surrounding rural population. Book-wagons with definitely planned routes have been used to supplement the work of the local library (e.g., at Hagerstown, Md., and by the library commissions of Connecticut and Delaware).

Rural libraries are of great educational significance because of their direct contact with the people they serve. The material they circulate becomes a force in the community to an even greater extent than it does in larger places. Numerically, the rural library exceeds any other type. No library movement which does not take into account the rural library can have more than partial success.

The great needs of rural libraries are more money for more and better books and for the payment of salaries which will attract and hold librarians who are not only socially-minded but who have education and book sense enough to get the books most needed for the specific communities the libraries serve.

The State library commissions are aiding the small libraries to get better books, through bulletins, book lists and other publications whose purpose is to advise the library in the selection of suitable books. The Wisconsin Free Library Commission regularly includes in its monthly «Bulletin» a «Selected list of current books.» The New York State Library issues an annual ‹Best Books for a Small Library.› The *Booklist* of the American Library Association serves a similar purpose for larger libraries. In the matter of salaries, the chief force at present is a growing realization, on the part of rural library boards, of the need of competent librarians. This is aided by a tendency, clearly apparent at present, toward the requirement of definite minimum educational and professional qualifications for all librarians engaged in public libraries of all types.

**Bibliography.**— The literature of rural libraries is relatively scanty. Valuable material is listed in Cannons, H. G. T., ‹Bibliography of Library Economy› (London 1910) and in ‹Library Work› (cumulated, Minneapolis 1912). The *Library Journal* and *Public Libraries* contain much material on the subject of rural and other small libraries. The most direct source of information is often the bulletins of the different library commissions, since these are chiefly devoted to the interests of small libraries.

Frank K. Walter,
*Vice-Director, New York State Library School.*

**RURAL SCHOOLS.** See Education, Elementary.

**RURAL AND FOLK THEATRES.** «The Little Country Theatre» of North Dakota not only illustrates the wide popularity of theatricals to-day, but also points to the deepening influence of the dramatic arts, almost religious in its intensity. The population of North Dakota is mainly foreign and made up of some 25 different nationalities, thinly scattered. There are 140 towns, each containing less than 500 people; and intellectual companionship and culture were not easily obtainable. Exodus to the big cities was the natural consequence. The solution of the problem of stemming this tide was found in the amateur community theatre for the rural districts. Established with this end in view by Alfred G. Arvold of North Dakota Agricultural College, in 1914 in Fargo, the Little Country Theatre has already succeeded far beyond expectations and spread into every corner of the State. It will serve as a model for many similar experiments already in the bud all over the land. The old dingy chapel on the second floor of the administration building of the Agricultural College was refurnished at slight cost into a theatre. Simplicity on every hand was the guiding principle. The young people did most of the writing, acting, costuming, scene-painting and scene-shifting for themselves. A moving-picture machine was installed. About 2,000 people participated in these home-talent plays; 1,600 pieces of play-matter were loaned in the course of a few months. The audiences were enthusiastic and sometimes aroused into good-humored excitement. North Dakota had solved her agricultural and social problem. One of the most-considered of all rural theatres is that founded and maintained by Maurice Pottecher, poet, dramatist and actor-manager, among the people of Bussang, a mountain district of the Vosges in France. In all times, from the far East to the far West, some form of rustic theatre (mainly itinerant) has existed. For the romantic particulars of the old strolling players, consult Mantzius, K., ‹History of Theatrical Art in All Ages.› For the recent people's theatre revival in Europe, a movement that has shown most energy in Germany and in Russia, consult Pottecher, Maurice, ‹Le Théâtre du peuple de Bussang (Vosges): son origine, son développement et son but exposés par son fondateur› (Paris 1913); Rolland, Romain, ‹Le Théâtre du Peuple: Essai d'esthetique d'un théâtre nouveau› (Paris 1904); Kahn, A., ‹Le Théâtre social en France› (Paris 1907); Morel, Eugene, ‹Projet de théâtres populaires› (in *Revue d'art Dramatique,* Vol. XV, pp. 1115–1188, Paris 1900); Le Braz, Anatole, ‹La Résurrection du théâtre populaire en Bretagne› (in *La Grande Revue,* Vol. VII, p. 140, Paris 1898); Van Dooren, J., ‹Le Théâtre du peuple› (in the *Revue de Belgique,* Series 2, Vol. XXVII, p. 31, Brussels 1899); Sellers, Edith, ‹The People's Theatre in Berlin› (in the *Contemporary Review,* Vol. LXXVII, p. 870, London 1900); Mehring, F., ‹Die Freie Volksbühne› (in the *Neue Zeit,* Vol. II, p. 530, Stuttgart 1900); Prod'homme, J. G., ‹Le Théâtre populaire en Bavière› (in the *Revue des Revues,* Series 3, Vol. XXXIII, p. 524, Paris 1900); Moderwell, H. K., ‹The Theatre of Today› (Boston 1914); Calvi, E., ‹Il Teatro popolare romanesco dal Medio Evo ai tempi nostri› (in the *Nuovo Antologia,* Series 5, Vol. CXXXIV, p. 689, Rome 1908); Long, R. E. C., ‹People's Theatre in Russia› (in the *Nineteenth Century and After,* Vol. LII, p. 775, London 1902).

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**RURIK,** roo'rĭk, founder of the Russian monarchy: d. 879. Most writers consider him to have been a Varangian, of Scandinavian origin, though Kostomorof has endeavored to prove that he was a Lithuanian. It is recorded that he came to Russia about 862, accompanied by his brothers Sinaf and Truvor, in compliance with the request of Gostomisl, a leading personage of Novgorod. One of the brothers established himself at Belozersk, the other at Izborsk, while Rurik began by fortifying himself in the ancient town of Ladoga, at the present day a miserable village on the Volkhof. The Novgorodians soon repenting, rose in rebellion against Rurik, and at their head was one of their fellow citizens named Vadim, whose valor is celebrated in the ancient chronicles and in Russian song. Rurik succeeded in establishing a dictatorship in Novgorod in 865 and is said to have killed Vadim with his own hand. His possessions were soon afterward greatly enlarged by the death of his brothers, whose principalities, since they died without issue, Rurik united to Novgorod. In order to secure himself and his descendants in their newly acquired territory, he invited various colonies of Varangians, on whose devotion he could count, to settle in the country. Rurik died after a reign of 17 years. The family of Rurik reigned in Russia until the death in 1598 of Feodor, son of Ivan the Terrible, when it was succeeded by the closely allied house of Romanoff.

**RUSBY, Henry Hurd,** American botanist and educator: b. Franklin, N. J., 26 April 1855. He was educated at the Westfield (Mass.) State Normal School, the Centenary Collegiate Institute, Hackettstown, N. J., the College of Physicians and Surgeons, New York, and the medical department of New York University; was botanical explorer for the Smithsonian Institution in the southwestern United States 1880–83, and privately in South America 1885–87 and in 1896, and in Mexico at various times since 1900; has been professor of botany and materia medica in the New York College of Pharmacy since 1888 and for many years dean of its faculty; professor of materia medica at Bellevue Medical College and New York University 1897–1902 and of the principles of stock-feeding in the American Veterinary College for many years. He is a member of many learned societies, chairman of the Scientific Directors of the New York Botanical Garden and honorary curator of the Economic Museum; since 1890, member of the committee for revising the United States Pharmacopœia. His greatest public services have been as a leader in reforming and standardizing pharmaceutical education in the United States and, as pharmacognosist of the United States Department of Agriculture (1912–17), for examining drugs offered for import at New York, since 1907, in purifying our foreign drug supplies, in which work he has been the chief agent. For this service he was elected to membership in the National Institute of Social Sciences. He was instrumental in securing the vindication of Dr. Wiley and his associates from charges in 1911 and in eliminating his detractors from the Department of Agriculture. His publications include ‘Essentials of Pharmacognosy’ (1895); ‘History of the New York College of Pharmacy’ (1895); ‘Morphology and Histology of Plants’ (1899); ‘Manual of Botany’ (1911); many pamphlets on the flora of South America, including the contribution of hundreds of new species and genera, and one family; botany, materia medica and physiology of the National Pharmaceutical Syllabus; botany and materia medica of the ‘National Standard Dispensatory’ and of Buck's ‘Reference Hand-book of the Medical Sciences,’ etc.

**RUSCHENBERGER,** rŭsh'ĕn-bĕrg'ĕr, **William Samuel Waithman,** American naval surgeon: b. Cumberland County, N. J., 1807; d. Philadelphia, 24 March 1895. He became surgeon's mate in the United States navy in 1826, took his M.D. at the University of Pennsylvania in 1830 and in 1831 re-entered the navy as surgeon. He was connected with the Naval Hospital at Brooklyn in 1843–47 and while there reorganized the laboratory to secure pure drugs for use in the service. He served with the East Indian, Pacific and Mediterranean squadrons, with intervals of land duty and at his retirement in 1869 he was senior officer of the Medical Corps. He was commissioned medical director on the retired list in 1871. Author of ‘Three Years in the Pacific’ (1834); ‘A Voyage Around the World, 1835–37’ (1838); ‘Notes During Voyages to Brazil and China’ (1848); ‘Elements of Natural History’ (1850), etc.

**RUSH, Benjamin,** American physician: b. Byberry, near Philadelphia, Pa., 24 Dec. 1745; d. Philadelphia, 19 April 1813. He was graduated from Princeton in 1760, from the University of Edinburgh in 1768, and became professor of chemistry at the College of Philadelphia in 1769. He was active in the pre-Revolutionary movements and as member of the provincial conference of 1776 moved the resolution declaring the expediency of a declaration of independence, of which he was a signer in the following month. He was surgeon to the Pennsylvania navy in 1775–76 and in 1777 was appointed surgeon-general and later physician-general of the hospitals of the middle section. In 1778 he resigned and resumed his practice and his professorship at Philadelphia. He was a member of the convention which formed the constitution of 1780, established the first dispensary in the United States in 1785 and in 1787 was a member of the convention which ratified the Federal Constitution. He became professor of the theory and practice of medicine in 1789 and after the Medical College was merged in the University of Pennsylvania was appointed professor of the institutes and practice of medicine and of clinical practice. In the yellow fever epidemic of 1793 Rush instituted a new method of treatment for the disease which he used with great success, visiting from 100 to 120 patients daily. He was one of the founders of Dickinson College, an advocate of the abolition of slavery, was connected with various religious and scientific societies and was treasurer of the United States Mint from 1799 until his death. He wrote ‘Medical Inquiries and Observations’ (5 vols., 1789–98); ‘Essays, Literary, Moral and Philosophical’ (1798), etc.

**RUSH, Richard,** American diplomat: b. Philadelphia, 29 Aug. 1780; d. there, 3 July 1859. He was graduated from Princeton in 1797, was admitted to the bar in 1800 and engaged in practice at Philadelphia. In 1811 he was appointed attorney-general of Pennsylvania and in 1814–17 was attorney-general of the United States. He was temporary Secretary of state under President Monroe in 1817 and was then appointed Minister to England, a post he occupied until 1825 when he was recalled to become Secretary of the Treasury under President Adams. He was a candidate for the vice-presidency on the ticket with Adams in 1828 and in 1836 was appointed by President Jackson commissioner to obtain the legacy for the founding of the Smithsonian Institution which was then pending in the English Chancery Court, returning in 1838 with the entire amount. He was appointed Minister to France in 1847 and remained such until 1851 when he was recalled at his own request and spent the remainder of his life in retirement. He published ‹Codification of the Laws of the United States› (5 vols., 1815); ‹Narrative of a Residence at the Court of London from 1817 to 1825› (1833); ‹Washington in Domestic Life› (1857); ‹Occasional Productions, Political, Diplomatic and Miscellaneous, Including a Glance at the Court and Government of Louis Philippe and the French Revolution of 1848› (published by his sons, 1860).

**RUSH, William**, American sculptor: b. Philadelphia, 4 July 1756; d. there, 17 Jan. 1833. He was apprenticed to a carver and soon became known as a maker of figure-heads which won admiration in many ports in the world He never worked in marble, confining himself to wood and clay, but gained a high reputation for his statues, busts and ideal figures executed in these materials. He served in the American Revolution and was a member of the city councils of Philadelphia for more than a quarter of a century. Among the most admired of his ship carvings were ‹Genius of the United States›; ‹Nature›; ‹Indian Trader›; ‹William Penn›; ‹River God.› He also executed ‹Exhortation›; ‹Praise›; busts of Linnæus, William Barton and Lafayette; statues of ‹Winter,› ‹Washington› (1814), etc.

**RUSH.** Many plants growing in moist land having cylindrical stems are called rushes, although generally with a qualifying adjective; as the bulrush (*Typha*), flowering rush (*Butomus*), or scouring rush (*Equisetum*), and some sedges (*Cyperaceæ*). The true rushes, however, are members of the grass-like family *Juncaceæ*, containing about 250 species in the several genera, and distributed throughout the temperate zones. Some are destitute of leaves but have barren flower stems resembling leaves; some have leafy stems, the leaves rounded or somewhat compressed and usually jointed internally; the foliage of others is very narrow, springing from the root. The round stems of the leafless species, sometimes bearing flowers, are popularly called rushes. The presence of this family in a pasture denotes bad drainage, and they are troublesome to farmers, since cattle will touch them only as a last resort. The common bog or soft rush (*Juncus effusus*) is found in wet places throughout the temperate world. It is a typical species, with glabrous tufts attaining perhaps four feet, springing from a stout rootstock and bearing an inflorescence composed of many small greenish grass-like flowers. This species is cultivated in Japan for making mats and with others is employed for the bottoms of chairs, baskets, coarse ropes for binding, etc. The stems of *J. conglomeratus* were formerly gathered by English farmers and stripped of their green rind, leaving exposed a large pith with one even lengthwise rib of rind left to support it. This porous pith was then bleached and dried and dipped in scalding grease, thus becoming the wick of a rude candle, or «rushlight,» which gave a good, clear light, and, if two feet long, would burn nearly an hour. These dried rush-piths were also used in place of cotton for wicks in open lamps.

Rushes, with a few sweet herbs, were scattered before processions and were strewn on stages in Shakespeare's time and on the floors of houses before the advent of carpets. The strewing of rushes in the churches grew into a religious festival conducted with much pomp. There rushes on the floor generally became so filthy from overlong use that to order fresh rushes was a sincere mark of honor to a guest.

Scouring rushes are the hollow, jointed stems of the horsetail (***Equisetum hiemale***) the edipermis of which is impregnated with silica, and was formerly used for scouring metals. See Dutch Rush.

Bulruches (*Typha*), or cat-tails, were somewhat employed in the place of true rushes, for mats and chair bottoms, and are also placed between barrel-staves.

**RUSH, Scouring.** See *Equisetales*, under Ferns and Fern Allies; Dutch Rush.

**RUSH MEDICAL COLLEGE**, located at Chicago, affiliated with the University of Chicago. It is one of the oldest educational institutions in the Northwest, having received its charter in 1837. The first lectures were delivered in 1843 and the first building erected in 1844; a larger building was erected on the same site in 1867. This was burned in the Chicago fire of 1871; and the present clinical building was erected in 1875. In 1887 the college became the Medical Department of Lake Forest University, retaining its autonomy. This relation, however, was dissolved in April 1898, and in the same month the college was affiliated with the University of Chicago (q.v.). The government of the college is vested in the «perpetual board of trustees» incorporated in 1837, of which the governor of the State, the lieutenant-governor and the speaker of the house of representatives are members ex officio. The board has control of the financial affairs of the college, appoints the faculty and delegates to the faculty the control of the educational work subject to the rules of the university and the approval of the trustees. By the terms of affiliation the board of trustees is composed of members not belonging to the teaching force of the college. In 1899–1900 the University offered courses corresponding to the work of the freshman year of the Medical College and since 1901 has offered instruction in all of the courses of the first two years of the medical curriculum: in anatomy, neurology, embryology, physiology, physiological chemistry, chemistry, chemistry of medical drugs, toxicology, pathology, bacteriology and pharmacology. All the work of the first two years is given at the university only and the work at the college is clinical, that is, the work of the last two years of the medical course. Students who take the first-year courses matriculate and register both as students of Rush Medical College and as students of the university. Many of the courses of the freshman and sophomore years are required while the courses of the junior and senior years are all elective, a certain amount of work in each department, however, being required for the degree of M.D. The university provides three fellowships for graduates of the college and offers the degree of B.S. to students who comply with the university requirements for that degree. The buildings of the college, distinct from those of the university, are the clinical building, Senn Hall and the laboratory building. The Presbyterian Hospital, adjoining the college, and the

Cook County Hospital, opposite the college, afford material for the clinics. The library contains over 21,000 volumes; the students number over 300. The college is open to women as well as men.

**RUSHFORTH, William Henry,** American inventor: b. Leeds, England, 11 July 1844; d. Rutherford, N. J., 21 Aug. 1892. He entered a railroad repair shop at 12 and at 19 had become a railroad engineer. He was chief engineer in charge of 13 stationary engines in 1874 and in 1878 came to the United States, where he became engineer in a silk factory at Camden, N. J. He was the author of numerous useful inventions, among them a fire-escape ladder, a series of automatic safety signals and a feed-water heater for utilizing the heat wasted in the smoke boxes of locomotives, the latter receiving a silver medal and a diploma at the Paris Exposition of 1887.

**RUSHVILLE,** Ill., city, county-seat of Schuyler County, on the Chicago, Burlington and Quincy Railroad, about 53 miles northwest of Springfield and 48 miles east-northeast of Quincy. It was settled 20 Feb. 1826 by Benjamin Chadsey, Levi Green and Thomas Barr, members of a commission that selected a town site. It was incorporated as a village 10 May 1831 and chartered as a city in April 1898. It is in an agricultural and coal mining region; the chief manufactories are a flour mill, machine shop, wagon works, harness shops, bottling works and file factory. It has considerable trade in farm products. The principal public buildings are the county courthouse and the jail. There are six churches, three public graded schools and the Rushville Normal and Business College. The government is vested in a mayor and a council of six members, who hold office for a term of two years. Pop. about 2,500.

**RUSHVILLE,** Ind., city, county-seat of Rush County, on Flat Rock Creek, and on the Cleveland, Chicago, Cincinnati and Saint Louis; the Cincinnati, Hamilton and Dayton; the Pittsburgh, Chicago, Cincinnati and Saint Louis and the Fort Wayne, Cincinnati and Louisville railroads, about 40 miles east-southeast of Indianapolis and 85 miles northwest of Cincinnati. It was settled in 1822, incorporated the same year and chartered as a city in 1882. It is in a fertile agricultural region and has considerable manufacturing interests. The chief manufactures are flour, furniture, machinery, agricultural implements, lumber, bent wood, drain pipe, clothing, clay-working machinery and washing machines. There are nine churches, a high school, public and parish schools, two private schools and a public library. The government is vested in a mayor and council of six members, elected every two years. The city owns and operates the electric-light plant and the waterworks. Pop. (1920) 5,498.

**RUSK, Jeremiah McLain,** American agriculturist: b. Morgan County, Ohio, 17 June 1830; d. Viroqua, Wis., 21 Nov. 1893. He removed to Wisconsin in 1853, engaged in farming, became sheriff and in 1861 was elected to the legislature. In 1862 he entered the Union army, was commissioned major and promoted lieutenant-colonel in 1863. He commanded a regiment in Sherman's Meridian campaign and for services in the Atlanta campaign was brevetted colonel and brigadier-general in 1865. He was mustered out of service in that year and in 1866–70 served as bank comptroller of Wisconsin. Elected to Congress in 1871 he remained there until 1877 and in 1882–89 was governor of Wisconsin. He was first Secretary of the newly-created Department of Agriculture under President Harrison in 1889–93.

**RUSK, Thomas Jefferson,** American politician: b. Camden, S. C., 8 Aug. 1802; d. Nacogdoches, Tex., 29 July 1856. He studied law, practised in Georgia, and in 1835 removed to Texas, where he took a prominent part in political affairs. He was a member of the convention which declared the independence of Texas in 1836, was its first Secretary of War, and after the disablement of General Houston took command of the army at San Jacinto. He was chief justice of Texas and in 1845 president of the convention which concluded annexation with the United States. He sat in the United States Senate in 1846–56.

**RUSKIN, John,** English critic and author: b. London, 8 Feb. 1819; d. Coniston, Lancashire, 20 Jan. 1900. He attended lectures at King's College, London, was trained in drawing and in 1836 went to Oxford, where he became a gentleman-commoner at Christ Church. In 1839, after two failures, he won the Newdigate prize for a poem on 'Salsette and Elephanta.' His first published works were essays in Loudon's *Magazine of Natural History* on geological and allied subjects (1834 and 1836), and in 1837–38 he wrote for Loudon's *Architectural Magazine* on 'The Poetry of Architecture' (separately published, 1893). An attack upon some of Turner's pictures in *Blackwood's Magazine* in 1836 led him to formulate the plan of his 'Modern Painters,' the first volume of which appeared in 1843 as by 'A Graduate of Oxford.' The second volume was published in 1846, the third and fourth in 1856 and the fifth in 1860 (complete edition, imperial 8vo, with all the original and three new plates, six volumes, 1888; 8vo edition, with reduced plates, six volumes 1897). At first intended as a defense of Turner, the work soon assumed a wider scope and became a comprehensive treatise on the principles of art. He sought to show the immense superiority of the best modern landscape painters, especially Turner, to all the ancients, and supported the spiritual against the sensuous theory of art with an eloquence and a breadth of knowledge which have indeed wrought, as Sydney Smith predicted, «a complete revolution in the world of taste.» The descriptions of natural scenery in the book are justly regarded as priceless gems of word-painting, and the sense of the indissoluble association of art with all other branches of human activity, so characteristic of Ruskin, became increasingly marked as the work progressed. His name was not put on the title-page till 1851.

After the publication of the first volume of 'Modern Painters' he continued his studies and his travels, and during a visit to Venice he definitely decided upon literature as his main work. In 1848 he married Euphemia Chalmers Gray, the 19-year-old daughter of a Scottish lawyer, for whom he had written in 1841 his fairy tale, 'The King of the Golden River' (published 1851). His married life was not very fortunate, and in 1854 the marriage was annulled and the lady married the artist Millais in 1855. ‹The Seven Lamps of Architecture› (1849) sought to do for architecture what Ruskin had already done for painting. The title and arrangement of the book are characteristic of his whole artistic criticism. All work in architecture, and in all else, should be illumined by the lamps of sacrifice, truth, power, beauty, life, memory and obedience. In 1851 he defended Millais and Holman Hunt, two of the pre-Raphaelite leaders, in letters to the *Times*, and in the same year followed up this advocacy by a work on pre-Raphaelitism. ‹The Stones of Venice› (1851–53), the fruit of much close study and arduous toil, is a worthy companion of ‹Modern Painters,› and in it, as in the earlier work, we meet the moralist as artist. The chapter ‹On the Nature of Gothic Architecture,› in which his economic teaching is distinctly foreshadowed, was reprinted by William Morris at the Kelmscott Press in 1892. In 1854 Ruskin came to know D. G. Rossetti, to whom he was a considerate and generous patron; and he was closely associated with F. D. Maurice, Furnivall and other Christian Socialists in the work of the Working Men's College, where he taught drawing regularly for some seven years. His career as a social reformer may be dated from 1857, when he published a series of lectures on ‹The Political Economy of Art› (enlarged edition, entitled ‹A Joy for Ever and its Price in the Market,› 1880). His chief works of this kind are ‹Unto this Last› (1862; popular edition, 1900), originally written for the *Cornhill Magazine*; ‹Munera Pulveris› (1862), partly reprinted from *Fraser's Magazine;* ‹Time and Tide by Weare and Tyne› (1867), and ‹Fors Clavigera› 1871–84), consisting of letters to the working men and laborers of Great Britain. In these the tendency to exaggeration is clearly manifest, and for a time it stood in the way of the serious consideration of his views. He laid especial stress upon the economic value of healthy, happy, honorable, self-sacrificing life; he directed attention to the vital importance of the problem of distribution and the necessity of economic co-operation; the need for a genuine national system of education, old-age pensions and a radical solution of the housing problem were eloquently set forth by him. In this work Ruskin always professed himself a follower of Carlyle, one of his warmest friends and admirers. Some of his books published after 1855 were collections of lectures. Such are ‹The Two Paths› (1859); ‹Sesame and Lilies› (1865); ‹The Crown of Wild Olive› (1866); ‹Work, Traffic, War and The Future of England› (last not in first edition), and ‹The Ethics of the Dust› (1866). In 1867 he delivered the Rede lecture at Cambridge on ‹The Relation of National Ethics to National Art.› and was awarded the honorary degree of LL.D. by that university, and in 1893 Oxford conferred upon him its D.C.L. degree. In 1871 he was elected lord rector of Saint Andrews University.

The period from 1870 until his retirement from active work was full of new schemes of social usefulness, some of them more generous in conception than practicable, but all bearing eloquent testimony to the absolute sincerity of his preaching of the gospel of social righteousness and service. In 1871 he founded the Guild of Saint George, and himself paid $35,000, a tenth of his possessions at that time, into a trust for carrying on its work. The basic principles of the guild were «that food can only be got out of the ground and happiness out of honesty,» and in connection with it he started agricultural settlements, some industrial enterprises and the Saint George's (now Ruskin) Museum at Sheffield.

In 1871 he gave up his house at Denmark Hill and purchased his well-known residence at Brantwood, on the shore of Coniston Lake. In 1870 he was appointed first Slade professor of fine arts at Oxford, and held this post until 1879, when he resigned owing to illness, and again from 1883 until 1884, when he again resigned. His lectures at Oxford give the best connected account of his maturer conceptions of art and form the material of the works: ‹Lectures on Art› (1870); ‹Aratra Rentelici: Six Lectures on the Elements of Sculpture› (1872); ‹The Eagle's Nest: Ten Lectures on the Relation of Natural Science to Art› (1872); ‹Ariadne Florentina: Six Lectures on Wood and Metal Engraving› (1873–76); ‹Val d'Arno: Ten Lectures on the Tuscan Art Directly Antecedent to the Florentine Year of Victories› (1874); ‹The Art of England› (1884); ‹The Pleasures of England› (1884), and ‹Lectures on Landscape Delivered in Lent Term, 1871› (1897). He founded a drawing school at Oxford, and during his professional period he tried the famous and exceedingly characteristic road-digging experiment, in which he set his pupils to work on the roads in order to improve the country. In 1878 he experienced the first of several attacks of brain fever, and from this time his excessive work at an unnaturally high pressure caused his health to break down seriously; 1878 was also the year of Whistler's libel action against him, in which the jury awarded one farthing damages. The most notable work of his period of final retirement, broken only by short journeys in search of health, is ‹Præterita: Outlines of Scenes and Thoughts Perhaps Worthy of Memory in My Past Life› (1885–89), the last volume containing ‹Dilecta,› or selections from his correspondence. This fragment of autobiography bears little trace of mental decay, but is notable for brilliant description, vivid recollection and excellent portraiture of men whom he had known. Of works not above mentioned the following are the most noteworthy: ‹Poems› (1850; privately printed; 2 vols., 1891); ‹Examples of the Architecture of Venice› (1851); ‹Lectures on Architecture and Painting› (1853); ‹Notes on Some of the Principal Pictures Exhibited at the Royal Academy› (1855–59 and 1875); ‹The Harbors of England› (1856), with engravings from drawings by Turner; ‹Catalogue of the Drawings and Sketches of Turner at present Exhibited in the National Gallery› (1881); ‹The Elements of Drawing› (1857), lectures delivered at the Working Men's College; ‹Inaugural Address at the Cambridge School of Art› (1858); ‹The Oxford Museum› (1859), with H. W. Acland; ‹The Elements of Perspective› (1859), lectures delivered at the Working Men's College; ‹The Queen of the Air› (1869), lectures on the Greek myths of cloud and storm; ‹Mornings in Florence› (1875–77; collected, 1889); ‹Proserpina: Studies of Wayside Flowers› (1875–86);

‘Deucalion: Collected Studies of the Lapse of Waves and Life of Stones’ (1875–83); ‘Saint Mark's Rest: the History of Venice’ (1877–84; collected, 1884); ‘The Laws of Fiésole: A Familiar Treatise on the Elementary Principles and Practice of Drawing and Painting’ (1877–78); ‘Notes on the Drawings by Turner Exhibited at the Fine Art Society's Galleries’ (1878; new ed., 1900); ‘Arrows of the Chace’ (1880), a collection of newspaper letters; ‘The Bible of Amiens’ (1880–85); ‘On the Old Road’ (1885), a collection of miscellaneous writings. In 1871 a collective edition of his works was begun, but extended to only 11 volumes. E. T. Cook was supervising a new complete edition of his works begun in 1903 and to be finished in 30 volumes. This «library edition» is now one of the greatest tributes to Ruskin's memory.

There is a complete bibliography by T. J. Wise and J. P. Smart (1893). Ruskin prepared the plates, or at least the drawings, for many of his own works, and also painted some landscapes, chiefly in water color. A loan exhibition of his drawings was held in the Royal Water Color Society's rooms in 1901.

To what has already been said of the work and message of Ruskin little need be added. He was essentially a prophet, on fire with the enthusiasm of humanity, almost fierce in his opposition to every kind of insincerity and injustice. His early religious views were narrow, but in middle life he advanced to a broadly liberal position of no distinctively Christian character, though in later years he added to his religious liberalism a more definitely Christian element. What he said of ‘Modern Painters’ may be applied to all his work: «It declares the perfectness and eternal beauty of the work of God; and tests all work of man by concurrence with, or subjection to that.» His teaching has been spread by many Ruskin societies, a Ruskin Hall for working men has been established at Oxford, and at Ruskin, Tenn., a co-operative colony was unsuccessfully attempted. (See MODERN PAINTERS; SEVEN LAMPS OF ARCHITECTURE; STONES OF VENICE). Consult Collingwood, ‘Life and Work of John Ruskin’ (1893), and ‘Life of John Ruskin’ (1900); Ritchie, ‘Records of Tennyson, Ruskin and Browning’ (1892); Spielmann, ‘John Ruskin’ (1900); Harrison, ‘Tennyson, Ruskin, Mill and Others’ (1899); Rossetti, ‘Ruskin, Rossetti and Pre-Raphaelitism’ (1899); Cook, ‘Studies in Ruskin’ (2d ed., 1891); Hobson, ‘John Ruskin, Social Reformer’ (1898); Mallock, ‘New Republic’ (1881 — Herbert represents Ruskin); Sizeranne, ‘Ruskin et la religion de la Beauté’ (1897; Eng. trans., 1899); Smart, ‘A Disciple of Plato’ (1883); Waldstein, ‘The Work of John Ruskin’ (1894); Mather, ‘Life and Teaching of John Ruskin’ (5th ed., 1898); Harrison, ‘John Ruskin’ (1902; ‘English Men of Letters,’ new series); Mackail's essay in Chambers' ‘Cyclopædia of English Literature’ (Vol. III, 1904); Kitchin, ‘Ruskin at Oxford and Other Essays’ (1904).

**RUSLING, James Fowler,** American soldier: b. Washington, N. J., 14 April 1834. He was graduated from Dickinson College in 1854 and was professor of natural science at Dickinson Seminary, Williamsport, Pa., in 1854–57, when he engaged in law practice. At the outbreak of the Civil War he entered the Union army with rank as lieutenant. He served in the Army of the Potomac in 1861–63, in the Department of the Cumberland in 1863–65, and in the War Department in 1865–67. He attained rank as colonel of volunteers in 1865, was brevetted brigadier-general in 1866, and mustered out of service in 1867. He was United States pension agent for New Jersey in 1868–77 and has published ‘Across America, or the Great West and Pacific Coast’ (1874); ‘History of Pennington Seminary’ (1890); ‘Men and Things I saw in Civil War Days’ (1899); ‘European Days and Ways’ (1902); ‘History of the Rusling Family’ (1908), etc.

**RUSS, John Denison,** American physician and philanthropist: b. Chebacco (Essex), Mass., 1 Sept. 1801; d. Pompton, N. J., 1 March 1881. He was graduated from Yale in 1823, studied medicine in the United States, in London, and on the Continent, in 1826 began practice in New York, in 1827–30 was in Greece aiding the patriots, and upon his return began the first instruction of the blind attempted in the United States. He was invited to organize the Institution for the Blind in Boston, but preferred to continue his independent work. In 1832 he became superintendent of the New York institution, a post which he resigned in 1858. His inventions and improvements for the assistance of the blind were widely used. Latterly he was active in endeavors to improve prison discipline and further the welfare of discharged prisoners.

**RUSSELL, Benjamin,** American journalist: b. Boston, Mass., 13 Sept. 1761; d. there, 4 Jan. 1845. He was apprenticed to Isaiah Thomas, publisher of the Worcester, Mass., *Spy,* but entered the Revolutionary army before completing his apprenticeship, and there collected war news for that paper. In 1784 he established the *Columbian Sentinel,* which he made the most powerful organ of the Federal party in New England, and which he edited until 1828. He also established and conducted in 1795–1830 the *Gazette,* likewise a Federalist organ. He printed the laws and State documents during the first sessions of Congress and refused to receive pay for his work until it was pressed upon him by Washington; represented Boston in the general court for 24 years; served several terms in the Massachusetts senate; was a member of the executive council, and of the constitutional convention in 1820.

**RUSSELL, Bertrand (Arthur William),** English philosopher: b. Trelleck, Monmouth, 18 May 1872; d. Pekin, 28 March 1921. He was a grandson of Lord John Russell, and the heir presumptive of the second Earl, his brother. He received his education at Trinity College, Cambridge, where he later became Fellow and lecturer. He also spent some terms at Oxford and in the spring of 1914 lectured at Harvard University. In 1915 he received the Butler gold medal from Columbia University for the most distinguished work in philosophy or education during the preceding five years. After the beginning of the European War, he was vigorous in his attempts to obtain peace by understanding. On 14 July 1916 he was deprived of his lectureship at Trinity on account of his pacifistic activities, which had caused him to incur a fine under the Defense of the Realm Act, and was later prevented from coming to Harvard for a second period of lecturing on account of the refusal of the British government to let him leave the country. In 1917 he was sentenced to six months' imprisonment on account of repeated violations of the Defense of the Realm Act. Russell was the protagonist of the new mathematical logic, and at the same time perhaps the most skilled dialectician among the adherents of the New Realism. His pacifism was intimately connected with an attitude toward the contemplative life which almost took the form of a worship. He published ‹German Social Democracy› (1896); ‹Essay on the Foundations of Geometry› (1897); ‹The Philosophy of Lerbris› (1900); ‹The Principles of Mathematics› (1903); ‹Philosophical Essays› (1910); ‹Principia Mathematica› (1910); with A. N. Whitehead, ‹Problems of Philosophy› (1911); ‹The Philosophy of Bergson› (1914), with H. W. Carr; ‹Our Knowledge of the External World as a Field for Scientific Method in Philosophy› (1914); ‹Scientific Method in Philosophy› (1915); ‹Mysticism and Logic› (1918); ‹Why Men Fight› (1916); ‹Principles of Social Reconstruction› (1917); ‹Political Ideals› (1918).

**RUSSELL, Sir Charles Arthur, Baron of Killowen**, English jurist: b. Newry, Ireland, 10 Nov. 1832; d. London, 10 Aug. 1900. He began his career as solicitor in 1854, later matriculated at Trinity College, Dublin, but did not graduate; and in 1856 removed to London, entered Lincoln's Inn and was admitted to the English bar in 1859. In 1872 he was made queen's counsel, and entered Parliament for Dundalk in 1880, but his part in debate was largely confined to questions concerning Ireland. In 1885 he was returned for South Hackney and became attorney-general in Gladstone's Cabinet in 1886. His speeches in behalf of home rule were his most notable parliamentary achievements. He was leading counsel for Parnell in the investigations brought about by the Parnell Commission Act of 1888, and his six days' speech concluding the trial on 12 April 1889 is accounted his greatest forensic effort. He defended the prisoner in the Maybrick murder trial; in 1893 represented Great Britain in the Bering Sea arbitration; in 1894 was made lord of appeal; was raised to a life-peerage as baron of Killowen, and later succeeded Lord Coleridge as lord chief justice. In 1896 he delivered an address before the American Bar Association at Saratoga, on ‹Arbitration: its Origin, History and Progress.› In 1899 he succeeded Lord Herschell as one of the arbitrators to determine the boundaries between British Guiana and Venezuela. His publications aside from his address on arbitration were mainly contributions to current discussions.

**RUSSELL, Charles Edward**, journalist and author: b. Davenport, Ia., 25 Sept. 1860. He was graduated at Saint Johnsbury Academy, Vermont, 1881; had a varied experience on several newspapers; was publisher of the *Chicago American* until 1 Jan. 1902, and later editorial writer on the *New York American*. From 1904 he contributed to periodical literature and lectured on sociological and literary topics. In 1910 and in 1912 he was the candidate of the Socialist party for the governorship of New York. In 1917 he was a member of the special diplomatic mission sent to Russia by the United States government. He is author of ‹Such Stuff as Dreams› (1902); ‹The Twin Immortalities› (1904); ‹The Greatest Trust in the World› (1905); ‹The Uprising of the Many› (1907); ‹Lawless Wealth› (1908); ‹Thomas Chatterton, the Marvelous Boy› (1908); ‹Songs of Democracy› (1909); ‹Why I am a Socialist› (1910); ‹Business, the Heart of the Nation› (1911); ‹Stories of the Great Railroad› (1912); ‹These Shifting Scenes› (1914); ‹The Story of Wendell Phillips› (1915); ‹Unchained Russia› (1918).

**RUSSELL, Charles Taze** («Pastor Russell»), American independent clergyman: b. Pittsburgh, Pa., 16 Feb. 1852; d. 31 Oct. 1916. He was privately educated and was in early life a Congregationalist. He began his career as an independent minister at Pittsburgh in 1878, later serving at the Brooklyn Tabernacle and the New York City Temple. He disclaimed being a founder of a new sect, but had about 50,000 followers of his teachings, writings and methods of Bible study. He interpreted the punishment of the Bible as eternal death, and believed in imminent millenium. He edited a semi-monthly journal *Zion's Watch Tower and Herald of Christ's Presence*, and was author of ‹Food for Thinking Christians — Why Evil Was Permitted› (1881); ‹Tabernacle Shadows of Better Sacrifices› (1881); and of a series originally published as ‹Millennial Dawn› (1886–1904) and later revised and reissued as ‹Studies of the Scriptures.› Of these volumes about 3,000,000 copies were sold.

**RUSSELL, Charles William**, Irish Roman Catholic theologian and educator: b. Killough, County Down, 14 May 1812; d. Dublin, 26 Feb. 1880. He was educated at Maynooth College, where he became connected with the faculty in 1835, taking the chair of ecclesiastical history in 1845, and becoming president in 1857. He was a noted antiquarian scholar and was prominently connected with the Tractarian movement, Cardinal Newman acknowledging his conversion to Roman Catholicism to be largely due to Russell. He was appointed to the Historical Manuscripts Commission in 1869, and was joint author of ‹A Report on the Carte MSS. in the Bodleian Library› (8 vols., 1871); he was joint translator of Schmid's ‹Catholic Tales› (3 vols., 1846), and of Leibnitz' ‹System of Theology› (1850). Author of ‹Life of Cardinal Mezzofanti› (1858). He also compiled ‹Calendar of Irish State Papers during the Reign of James I› (4 vols., 1872–77).

**RUSSELL, David Allen**, American soldier: b. Salem, N. Y., 10 Dec. 1820; d. near Winchester, Va., 19 Sept. 1864. He was graduated from West Point in 1845, served in the Mexican War and in 1847 was brevetted 1st lieutenant for gallant conduct. He subsequently served on the Pacific Coast, was brevetted captain in 1854, later took part in the Mexican War, and at the outbreak of the Civil War was assigned to aid in the defense of Washington. In 1862 he was appointed colonel and served in the Peninsular campaign under McClellan. He commanded a brigade in the Rappahannock campaign, was brevetted colonel in the regular army, assisted in the capture of the Rappahannock station and commanded a division at the battles of the Wilderness, Spottsylvania and

North Anna. He was engaged in the defense of Washington in August and September 1864, and was killed while leading his column at Opequan, Va., 19 Sept. 1864. He was brevetted major-general of the regular army the same day.

**RUSSELL, George W.** («A. E.»), an Irish poet: b. 1867. He studied art in Dublin, and his paintings received favorable comment from George Moore. He became a great student of Eastern philosophy and transcendentalism, which developed his own tendency toward mysticism. He is also a man of practical sense in political questions and his advice has often been accepted by Sir Horace Plunkett and the Irish radicals. His poems are charming in quality, and rank with the best verse produced by the Irish Literary Revival. Among his poetical works are ‹Homeward: Songs by the Way› (1894); ‹The Earth Breath and Other Poems› (1897); a selection of his poems called ‹Nuts of Knowledge› (1903); ‹The Divine Vision and Other Poems› (1904); ‹The Spirit of England› (1915); ‹Collected Poems› (1915); and a three act drama in prose, ‹Deirdre,› which was performed several times by the the Irish National Theatre society. His political works are ‹Co-operation and Nationality› (1913); ‹The National Being: Some Thoughts on Irish Polity› (New York 1916); ‹Nationality and Imperialism› (in ‹Ideals in Ireland› by Lady Gregory, 1901; pp. 13–22); ‹The Irish Home-Rule Convention› (three essays, the other two by Sir Horace Plunkett and John Quinn, New York 1917); Russell's essay ‹Thoughts for a Convention,› attempts to analyze the mood and demands of the various factions in his country.

**RUSSELL, George William Erskine,** English statesman and author: b. London, 3 Feb. 1853; d. 17 March 1919. He was educated at University College, Oxford. He served in Parliament in 1880–85 and was returned in 1892. He was Parliamentary Secretary of the Local Government Board in 1883–85; Under Secretary of State for India in 1892–94; and of the Home Department in 1894–95. He was alderman of the city council of London in 1889–95, and became a Privy Councilor in 1907. His social and political connections added to the interest felt in his writings. He wrote ‹Collections and Recollections› (2 series, 1898–1903); ‹Edward King, 60th Bishop of Lincoln› (1912); ‹The Spirit of England› (1915); ‹Portraits of the Seventies› (1916); ‹Politics and Personalities› (1917); ‹Basil Wilberforce, a Memoir› (1918); ‹Lady Victoria Baxton› (1919), etc., bright and entertaining pictures of contemporary life which will be of service to future social historians.

**RUSSELL, Harry Luman,** American bacteriologist and educator: b. Poynette, Wis., 12 March 1866. He was graduated at the University of Wisconsin in 1888, and later studied at Berlin, the Pasteur Institute, Paris, the Zoological Station, Naples, and in 1892 took his Ph.D. at Johns Hopkins. From 1893 he was a member of the faculty at the University of Wisconsin, where he has been Dean of the Agricultural College and Director of the Experiment Station since 1907. He was also Director of the State Hygienic Laboratory in 1903–08. Author of ‹Outlines of Dairy Bacteriology› (1894–1905); and of the ‹Reports› and ‹Bulletins› of the Wisconsin Experiment Station since 1893. He is joint author of ‹Public Water Supplies› (1910); ‹Agricultural Bacteriology› (1915), etc.

**RUSSELL, Henry,** English singer and song writer: b. Sheerness, Kent, 24 Dec. 1812; d. Maida Vale, 8 Dec. 1900. He made his first appearance on the stage at the age of three, and later studied at Bologna and at Naples. He toured Canada and the United States in 1833–41, giving recitals of his own songs with great success, which was afterward duplicated in London and the Provinces. He also produced an entertainment ‹The Far West,› which not only was successful but greatly stimulated immigration to western America. He composed the music for about 800 songs, among which were ‹Cheer, Boys, Cheer›; ‹There's a Good Time Coming›; ‹A Life on the Ocean Wave,› etc. His reminiscences were published under the title of his greatest song success, ‹Cheer, Boys, Cheer› (1895).

**RUSSELL, Henry Benajah,** American journalist: b. Russell, Mass., 9 March 1859. He was graduated from Amherst in 1881, was attached to the New York *Sun* 1884–88, was on the editorial staff of the Providence *Journal* 1888–90, and of the Hartford *Post* 1890–97. Editor of Springfield *Homestead* 1902–13, editorial writer Hartford *Times* 1913. He has published ‹Life of William McKinley› (1896); ‹International Monetary Conferences› (1898); ‹Our War with Spain› (1899).

**RUSSELL, Howard Hyde,** American Congregational clergyman: b. Stillwater, Minn., 21 Oct. 1855. He took his degree in law at Indianola College, Iowa, and later was graduated at the Oberlin Theological Seminary. He practised law at Corning in 1878–83, and was ordained in the Congregational ministry in 1885. He held various pastorates until 1893, when he founded the Anti-Saloon League in Ohio. He acted as its superintendent until 1897, when he became superintendent of the National Anti-Saloon League of America; he filled that position with the New York Anti-Saloon League in 1901–09, since when he has been associate general superintendent of the National Anti-Saloon League of America. Author of ‹A Lawyer's Examination of the Bible› (1893).

**RUSSELL, Irwin,** American poet: b. Port Gibson, Miss., 3 June 1853; d. en route to California, 23 Dec. 1879. He was graduated at the University of Saint Louis in 1869, studied law and was admitted to the bar at 19 years of age, the age limit of 21 being overruled by the legislature because of his brilliant examination. He abandoned law for literature in 1876, established himself in New York and there speedily gained a reputation for his verse, which was characterized by unusual grace and strength. He also made a reputation for his verses delineating negro character, many of which were published in the *Century Magazine*. His works were published with an appreciative introduction by Joel Chandler Harris (1888).

**RUSSELL, Israel Cook,** American geologist: b. near Garrattsville, N. Y., 10 Dec. 1852; d. Ann Arbor, Mich., 1 May 1906. He was educated at the College of the City of New York and Columbia School of Mines, and accompanied the United States expedition to New Zealand to observe the transit of Venus. In 1875 he became assistant professor of geology at Columbia, and from 1880 was attached to the United States geological survey, for which he made surveys in the Rocky Mountains, Southern Appalachian regions and in Alaska. In 1879 he ascended the Yukon and made his way to Lynn Canal, and in 1890–91 led expeditions to Mount Saint Elias. In 1892 he became professor of geology at the University of Michigan. His contributions to geography and geology embrace ‘Geological Reconnaissance in Central Oregon’ (1883); ‘Geological History of Lake Lahontan’ (1885); ‘Quaternary History of Mono Valley, California’ (1887); ‘Existing Glaciers of the United States’ (1889); ‘Subaerial Decay of Rocks’ (1889); ‘A Second Expedition to Mount Saint Elias’ (1892); ‘A Geological Reconnaissance in Central Washington’ (1893); ‘Lakes of North America’ (1895); ‘Present and Extinct Lakes of Nevada’ (1895); ‘Glaciers of North America’ (1897); ‘Volcanoes of North America’ (1897); ‘Rivers of North America’ (1898).

**RUSSELL, John,** 1st Earl Russell, English statesman, third son of John, 6th duke of Bedford: b. London, 18 Aug. 1792; d. Richmond Park, Surrey, 28 May 1878. He was educated at Edinburgh University, where he trained himself to debate at the meetings of the Speculative Society. In July 1813 he entered Parliament and soon gained prominence among the politicians of the day. He early took up the subject of parliamentary reform and supported the repeal of the Test and Corporation Acts and Roman Catholic emancipation. In 1828 he had the satisfaction of seeing the Test and Corporation Acts repealed by the Wellington ministry, and in April 1829 the Catholic Relief Bill became law. When the Grey Cabinet was formed in 1830 Lord John Russell, then paymaster-general of the forces, was elected one of the committee of five to formulate a Reform Bill. This was brought before the House of Commons, 1 March 1831, by him, and though he defended it clause by clause with extraordinary vigor, it was ultimately rejected. Upon this the Whig ministry resigned and an appeal made to the country. The elections resulted in a majority favorable to the bill, which received the royal sanction 7 June 1832. In Lord Melbourne's second Cabinet (1835–41) he was at first Home Secretary and then Colonial Secretary, and on the outbreak of the Canadian rebellion, by recognizing the right of the colonies to self-government, reconciled them to the mother country. From 1841 (in which year he became member for the city of London) to 1845, during the Peel administration, Lord John Russell led the opposition, but lent his influence in favor of the repeal of the corn-laws. He was Premier 1846–52, and was able to pass his Ecclesiastical Titles Bill of 1851, prohibiting the assumption of the territorial titles by Roman Catholic bishops. Lord Derby, who followed him, soon resigned and under the succeeding administration of Lord Aberdeen, Russell was Foreign Secretary for a short time. He also filled the post of lord-president of the council from June 1854 to February 1855. He was Colonial Secretary under Lord Palmerston in 1855, and represented Great Britain in the Vienna conferences; but his conduct of the negotiations brought him so much unpopularity that he resigned in July of that year. When Palmerston returned to power in 1859 Lord John again became Foreign Secretary, with a seat in the Cabinet. He took a leading part in regard to such political questions as the oppression of the Poles by Russia, the aggressive policy of German powers toward Denmark and the disputes between England and the United States as to the neutrality observed during the continuance of the Civil War. He retained his seat for the city of London from June 1841 until July 1861, when he was raised to the peerage as Earl Russell. After the death of Lord Palmerston, 18 Oct. 1865, Earl Russell became Prime Minister for the second time, Gladstone taking the lead in the House of Commons. During the session of 1866, in conjunction with Gladstone, he introduced a new Reform Bill, which, failing to pass, the ministry resigned and was succeeded by that of Lord Derby. Thenceforth Earl Russell held no office in any ministry, though he always took an active part in promoting Liberal measures. He published among other works ‘History of the British Constitution’ (1821); ‘Essay on the History of the English Government’ (1823); ‘Memoirs of the Affairs of Europe’ (1824–29); ‘Essay on the Causes of the French Revolution’ (1832); ‘Memoirs and Correspondence of Thomas Moore’ (1852–56); ‘The Life and Times of Charles Fox’ (1859–66); ‘Selections from Speeches of Earl Russell, 1859 to 1865’; ‘Recollections and Suggestions, 1813–73’ (1875). Consult Walpole, ‘Life of Lord John Russell’ (1889); Reid, ‘Lord John Russell’ (1895); Russell, R., ‘Early Correspondence of Lord John Russell’ (2 vols., London 1913).

**RUSSELL, John Scott,** Scottish engineer and naval architect: b. Glasgow, 8 May 1808; d. Ventnor, Isle of Wight, 8 June 1882. He was educated at the universities of Edinburgh, Saint Andrews and Glasgow, graduating from the latter at 16. In 1832 he was professor of natural philosophy in Edinburgh University. During his researches into the nature of waves he discovered the existence of the wave translation, on which he founded the wave-line system of construction of ships introduced into practice in 1835. In 1844 he removed to London and was for many years a well-known shipbuilder on the Thames. He became joint-secretary of the Royal Commissions for carrying out the Great Exhibition of 1851 and took a leading part in organizing it. He built the *Great Eastern*; was joint-designer of the first English seagoing armored frigate, the *Warrior*, and constructed the vast dome of the Vienna Exhibition of 1873. He published ‘The Modern System of Naval Architecture for Commerce and War’ (1864–65); ‘Systematic Technical Training for the English People’ (1869); and ‘The Wave of Translation in the Ocean of Water, Air and Ether’ (new ed., 1885).

**RUSSELL, Lillian** (Mrs. Alexander P. Moore), American comic opera singer: b. Clinton, Iowa, December 1861; d. Pittsburgh, Pa., 6 June 1922. She sang in ‘Pinafore’ in 1879, and appeared in New York at Tony Pastor's Theatre. She became the star in McCall's Opera Company and played leading parts in ‘Snake Charmer,’ ‘Olivette,’ ‘Patience’ and ‘The Sorcerer.’ She sang in London in 1883 and returned to New

York in 1885, from which date until 1891 she sang at the Casino in various rôles, and later at Weber and Fields' Music Hall. She long retained her hold as a popular favorite and finally retired from the stage, but still kept in prominence by journalistic contributions and advice on topics of general feminine interest.

**RUSSELL, William,** Lord, English statesman: b. 29 Sept. 1639; d. London, 21 July 1683. He was educated at Cambridge, was elected to Parliament for Tavistock in 1661 and became one of the leaders of «the country party» in 1673, coming forward in opposition to the attempts of the king and his partisans to destroy English freedom through the aid of France. In 1678 he became Lord Russell and heir apparent to the earldom of Bedford. On 14 March 1678 he seconded the motion to declare war against France and spoke in support of it. In November 1678 he was chosen to move in the House of Commons that the Duke of York should be removed from the king's presence and councils. When the new council proposed by Sir William Temple was formed Lord Russell was appointed one of the 30 members. He was not at first in favor of excluding the Duke of York from the succession, but finally supported the measure. He left the council at the beginning of 1680. On 26 October he spoke in favor of measures against «popery and to prevent a popish successor» to the Crown; and a week later seconded Colonel Titus' motion to disable the Duke of York from becoming King of England. When the reaction against the Whigs took place, the government of Charles II resolved to destroy their leaders, proceeding to do so according to the forms of law. He was arrested on the charge of having been concerned in the Rye House plot, said to have been formed by Rumboldt and others, for an attack on the king and the Duke of York, and after his examination was committed to the Tower. His trial took place at the Old Bailey, 13 July 1683. The charge against him was «for conspiring the death of the king and consulting and agreeing to stir up insurrection; and to that end to seize the guards (appointed) for the preservation of the king's person.» No counsel was then allowed to the accused, except on points of law; his condemnation quickly followed and he was beheaded in Lincoln's Inn Fields. Consult ‹Life of William, Lord Russell,› by Lord John Russell (1819).

**RUSSELL, William Clark,** English novelist: b. New York, 24 Feb. 1844; d. 1911. Educated at Winchester and Boulogne, he was a midshipman in the merchant service 1857–65. His first sea-story, ‹John Holdsworth, Chief Mate,› appeared in 1874 and was very successful; but he won still greater success with ‹The Wreck of the Grosvenor› in the following year. Among his numerous novels are ‹An Ocean Free Lance› (1878); ‹My Shipmate, Louise› (1882); ‹A Sea Queen› (1883); ‹An Ocean Tragedy› (1881); ‹Alone on a Wide, Wide Sea› (1892); ‹The Emigrant Ship› (1894); ‹The Convict Ship› (1895); ‹What Cheer!› (1895); ‹List, Ye Landsmen!› (1897); ‹The Two Captains› (1897); ‹Romance of a Midshipman› (1898); ‹A Voyage at Anchor› (1899); ‹The Pretty Polly› (1900); ‹The Ship's Adventure› (1899); ‹His Island Princess› (1905); several collections of short stories, and lives of Nelson (1890) and Collingwood (1891). He was for some time connected with the Newcastle *Daily Chronicle*, but for several years, ending in 1887, was on the staff of the London *Daily Telegraph*.

**RUSSELL, William Eustis,** American lawyer and political leader: b. Cambridge, Mass., 6 Jan. 1857; d. Little Palos, Quebec, Canada, 16 July 1896. He was graduated from Harvard in 1877, and from the Boston University Law School in 1879, winning the Lawrence prize for the best legal essay. He was admitted to the Massachusetts bar in 1880 and began the practice of law with his father's firm. He also became an active member of the Democratic party; was elected to the common council of Cambridge in 1881, to the board of aldermen in 1883 and 1884; and was mayor of the city 1885–87. His efficient administration as mayor, and his effective campaign speeches during the Presidential campaign of 1884, had made him a prominent figure in State politics, and in 1888 he was the Democratic nominee for governor. He was defeated in that year and again in 1889, but in 1890 was elected and twice re-elected in 1891 and 1892. He took an active part in all his gubernatorial campaigns, making numerous speeches in all parts of the State. His election as governor for three successive years was a remarkable testimony to his personal integrity and popularity, as the majority of the legislature and the State officials were Republicans. Several laws were passed on his recommendation, including a measure to regulate the lobby, and a law abolishing the property qualification for governor and the poll tax. At the close of his term he resumed the practice of law, and in 1894 was appointed a member of the board of Indian commissioners. In 1896 he was one of the most active opponents of the adoption of the free silver platform at the Democratic National Convention, and distinguished himself by a remarkable speech pleading for a return to the original principles of the Democracy; he was prominently mentioned as a candidate for the presidency by those who favored the gold standard. His death occurred suddenly, shortly after the convention, and was thought to be due largely to the strain he had undergone at that time.

**RUSSELL, Sir William Howard,** English journalist: b. near Dublin, Ireland, 28 March 1820; d. London, England, 10 Feb. 1907. He was educated at Trinity College, Dublin, and was called to the bar in 1852. His journalistic career began in 1843 on the staff of the London *Times*. He was its special correspondent during the Danish war of 1848–50, during the Crimean war, in 1854–56, reported the Indian mutiny in 1857–58, the Italian campaign 1859, the Civil War in the United States in 1861–62, the Danish war of 1864, the Prusso-Austrian war 1866, and the Franco-Prussian war of 1870. He accompanied the Prince of Wales to Egypt in 1868 and was his honorary private secretary on his visit to India in 1875. In 1879–80 he was again engaged as war correspondent in South Africa, and in 1883–84 was on that duty in Egypt. He was knighted in 1895 and was editor of the *Army and Navy Gazette*. His publications include ‹British Expedition to Crimea›; ‹Diary in India›; ‹My Diary — North and South› (1863); ‹The Prince of Wales Tour› (1877); ‹Hesperothen› (1882); ‹The Great War with Russia› (1895); ‹Todleben's Sebastopol›, etc.

**RUSSELL SAGE FOUNDATION,** an institution established in April 1907, by Mrs. Russell Sage, with an endowment of $10,000,000, for the improvement of social and living conditions in the United States of America. It does not attempt to relieve individual or family needs, but by study and investigation to eradicate the causes of distress. The work is distributed among several departments, including the Charity Organization Department, Department of Child Helping, Division of Remedial Loans, Department of Surveys and Exhibits, Division of Recreation and Division of Education. Publications are issued by each department. The Division of Education has made contributions to the subject of medical inspection of the schools, and to the question of retardation and elimination of pupils. The Division of Recreation has done much to develop the community centre idea; and the Division of Remedial Loans has thrown much light on the methods of loan sharks and promoted co-operative loan societies. The Foundation has also supervised the development of the model suburban community at Forest Hills, Long Island. The Department of Surveys and Exhibits has, by its constant efforts, kept the community informed of its problems and thereby has served to educate public opinion. Consult Ayres, L. P., ‹Seven Great Foundations› (New York 1911).

**RUSSELL'S VIPER,** one of the largest and most venomous serpents (*Daboia russelli*) of the East Indian region; justly dreaded throughout southern and eastern India, Ceylon, Burma and Siam. It may reach a length of five feet, and is yellowish-brown with three longitudinal series of black, light-edged rings, which sometimes encircle reddish spots. It is known also as chain-viper, tic-palonga (Ceylon), etc., and is regarded by experts as the most deadly in India. Fortunately, however, it is neither as numerous nor as easily provoked as the cobra. According to Fayrer it is nocturnal in its habits, sluggish and does not readily strike unless irritated, when it bites with great fury; moreover its loud hissing when disturbed is likely to give one sufficient warning to enable him to jump out of reach. It is said to kill many grazing cattle. The action of its poison resembles that of the rattlesnake, but gives rise to hæmorrhagic extravasations from the kidneys and various other organs. Consult Fayrer, ‹Thanatophidia of India› (1874); Gadow, ‹Amphibia and Reptiles› (1901).

**RUSSELLVILLE,** Ark., town, county-seat of Pope County, on the Saint Louis, Iron Mountain and Southern and the Dardanelle and Russellville railroads, about 80 miles northwest of Little Rock. It is in an agricultural region in which the chief product is cotton. The lumber interests are quite important. The principal manufactures are cotton, dairy and lumber products, flour and agricultural implements. The two banks, one National and one State, have a combined capital of $80,000. Pop. (1920) 4,505.

**RUSSELLVILLE,** Ky., city, county-seat of Logan County, on the Louisville and Nashville Railroad, about 25 miles west-southwest of Bowling Green and 52 miles north by west of Nashville. It is in an agricultural region in which tobacco is one of the chief products. The principal manufacturing establishments are flour mills, tobacco factories, wagon and carriage works and furniture factories. It contains the Logan Female College (M. E. S.), established in 1867, the Bethel College (Baptist), founded in 1854, public schools and a public library. The three State banks have a combined paid-up capital of $75,000. Pop. (1920) 3,124.

**RUSSELLVILLE, Engagements at.** After the defeat of Gen. W. E. Jones at Morristown, Tenn. (q.v.), 10 Dec. 1863, he was followed by a Union force under Colonel Graham, and when near Russellville, Graham ran into General Morgan's cavalry division, which was foraging. Graham was attacked and driven back, leaving some dead, wounded and prisoners in the hands of the Confederates. Late in October 1864 Col. J. B. Palmer, 58th North Carolina, with about 800 men and three guns, moved from North Carolina into East Tennessee to co-operate with the Confederate troops under General Vaughn, and 28 October he was ordered by Vaughn to take position in the rear of Russellville, on the Bull's Gap road. He had scarcely taken position when Vaughn's brigade, defeated at Morristown, swept past him in great disorder. He formed line, threw out skirmishers, and opened fire with his three guns upon Gillem's pursuing troops, checking them and enabling Vaughn to rally about 200 of his men. General Gillem, who with a brigade, was at Henderson's Depot on 8 Nov. 1864, hearing that General Breckinridge was advancing to reconquer East Tennessee, fell back to Greeneville on the 9th and to Bull's Gap on the 10th, where he was attacked on the morning of the 11th by General Duke's cavalry brigade, but held his own during the day. The attack was renewed by Breckinridge on the 12th with artillery; he next assaulted in front and in rear with cavalry, both being repulsed. Breckinridge again renewed the attack on the 13th, and kept it up all day. Gillem being now almost out of ammunition, and without food for his men and forage for his horses, abandoned his position during the night and fell back toward Russelville. He took position on the road, at its intersection with the Knoxville and Greeneville road, intending to hold that point until his trains had passed it. Nearly all his trains had passed, and were going through Russellville, when, on the 14th, his rear was attacked by Breckinridge with the brigades of Duke and Vaughn. His men were thrown into disorder, became panic-stricken, could not be rallied and retreated through Russellville to Strawberry Plains. He had 41 killed and wounded, and lost six guns, 132 wagons and ambulances, and 300 horses. About 200 of his men were captured. Consult ‹Official Records› (Vols. XXXI and XXXIX).